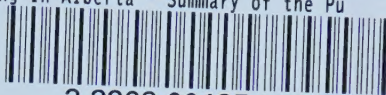


2

CA2 ALEV 2  
1972S76  
c.1

CA2 ALEV 18 1972S02  
Impact on the Environment of Surface Min  
ing in Alberta - Summary of the Pu 1



3 3398 00135 2789

# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA

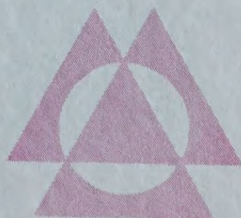
## SUMMARY OF THE PUBLIC HEARINGS

DECEMBER, 1971  
JANUARY, 1972

LIBRARY  
VAULT 19

ENVIRONMENT CONSERVATION  
AUTHORITY

ALBERTA







# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA



## **SUMMARY OF THE PUBLIC HEARINGS**

**DECEMBER, 1971**

**JANUARY, 1972**

**ENVIRONMENT CONSERVATION  
AUTHORITY**

**9912 - 107 STREET,**

**EDMONTON, ALBERTA**



COPIES OF THIS REPORT MAY BE OBTAINED  
UPON REQUEST TO

**ENVIRONMENT CONSERVATION AUTHORITY**

9912 - 107th STREET · EDMONTON, ALBERTA · T5K 1G5 ·

TEL. (403) 423-2247

APRIL 15, 1972



## FOREWORD

Soon after its formation the Environment Conservation Authority had been requested by the Government of Alberta to conduct comprehensive and wide-ranging hearings on the impact on the environment of resource development in Alberta. More specifically, the Authority was asked through Public Hearings to review all present legislation and industry practices relevant to the conservation and reclamation of land that is disturbed as a result of coal, oil, gas and forestry development. Attention was also to be paid to the integrity of watershed areas.

The general objective of the Authority was, through the Hearings, to develop advice for the Lieutenant Governor-in-Council on preventive and reclamation procedures that were sufficiently adequate to assure that these resource developments might be conducted in such a fashion that permanent environmental damage would not result therefrom.

In November, 1971, the Honourable W.J. Yurko, Minister of the Environment, directed the Authority to move with particular urgency on those aspects of its Hearings on the impact on the environment of resource development that had to do with surface mining for coal. The Minister had previously expressed concern about the after-effects of mining practices with the announcement that surface reclamation legislation would be rewritten for presentation at the next session of the Legislature, and he wished to have the benefit of the advice that could be developed through Public Hearings to aid him in this task.

The Authority accordingly held Hearings in major population centres in Alberta in December, 1971, and January, 1972. These Hearings constitute the first phase of the enquiry requested of the Authority into the environmental effects of resource development in the Province. Subsequent phases on oil and gas development and on forest utilization are to follow.

DR. W.R. TROST, Chairman,  
Environment Conservation Authority

## ACKNOWLEDGEMENTS

The contribution that a public hearing can make to the advancement of any subject depends entirely on the submissions, briefs and presentations made to it by members of the public. The Environment Conservation Authority is very much appreciative of the considerable efforts of individuals, groups and associations in preparing their submissions to the hearings, and indeed in acting to bring about the hearings themselves.

The Authority also very much appreciates the wise and thoughtful way in which the submissions were prepared and presented, all the more so since the subject of the hearings is one in which sharply held and conflicting opinions exist. Though the strength of opinion was in no way diluted in their presentation through the hearings, the reliance on reason, on logic and on a respectful attention to the views of others emphasized the broad areas of agreement that existed between conflicting parties. The hearings also directed attention and developed further insights into those areas of disagreement that might still have remained among the several sectors of the public after the hearings had closed.

The Authority wishes to thank and commend the participants in the hearings for the reasoned way in which they presented their own views, and the thoughtfulness with which they attended to the views of others.



## TABLE of CONTENTS

Foreword.....	iii
Acknowledgements.....	iv
Introduction.....	1
Consultant's Report.....	5
Submissions from Federal Government Agencies, Cities, Counties, Planning Commissions and Councils.....	15
Canada. National and Historic Parks Branch.....	16
Canada. Department of Environment.....	17
City of Lethbridge.....	23
City of Red Deer.....	25
County of Paintearth.....	26
Peace River Regional Planning Commission.....	32
British Columbia Peace River-Liard Regional Planning District.....	33
Oldman River Regional Planning Commission.....	33
Red Deer Regional Planning Commission.....	36
Research Council of Alberta (Geology Division).....	39
Submissions from Industry and Commercial Concerns.....	43
Coleman Collieries Limited.....	44
Luscar Limited.....	49
McIntyre Coal Mines Limited.....	57
Sterling Coal Valley Mining Company.....	60
Alberta Coal Limited.....	63
Canmore Mines Limited.....	72
Coal Association of Canada.....	78
Consolidation Coal Company of Canada Limited.....	84
Canadian Utilities Limited.....	86
Calgary Power Limited.....	91
Proctor and Gamble Cellulose Limited.....	93
Pegasus Experimental Metals and Mining Limited.....	98
I-XL Industries Limited. Brick and Tile Division.....	99
Master Explorations Limited.....	103
Abcon Engineering (Alberta) Limited.....	106
Macroplan Consultants Limited.....	110
Nick's Landscaping.....	112
Submissions from Organizations, Citizen Associations, and Other Groups.....	113
Wild Kakwa.....	114
Rocky Mountain Ramblers Association.....	117
Lethbridge Natural History Society.....	118
Edmonton Natural History Club.....	119
Alpine Club of Canada. Edmonton Section.....	120
National and Provincial Parks Association of Canada Edmonton Chapter.....	123
National and Provincial Parks Association of Canada Calgary-Banff Chapter.....	125

Calgary Field Naturalists Society.....	128
The Bow Valley Naturalists Club .....	129
Alberta Wilderness Association.....	132
Canadian Wolf Defenders and Defenders and Wardens of Nature (DAWN).....	135
Pollution Control - Southern Alberta.....	136
Interdisciplinary Committee for Environmental Quality.....	138
STOP (Save Tomorrow Oppose Pollution).....	141
SPEC (Society for Pollution and Environmental Control).....	142
Calgary Eco-Centre Society.....	143
Wapiti Fish and Game Association.....	144
Lethbridge Fish and Game Association.....	145
Alberta Fish and Game Association, Zone 1.....	145
St. Albert and District Fish and Game Association.....	146
Communications Employees Fish and Game Association.....	147
Alberta Fish and Game Association.....	148
Alberta Fish and Game Association, Zone 3.....	149
Red Deer Fish and Game Association.....	150
Dickson Fish and Game Association.....	152
Lacombe Fish and Game Association.....	152
Big Game and Guide Outfitters.....	153
Hook and Hackle Club.....	154
International Union of Operating Engineers.....	155
Alberta Federation of Labour.....	156
United Mine Workers of America.....	157
Unifarm, Region 1.....	157
Unifarm, Region 14.....	158
Unifarm.....	159
Liberal Party in Alberta.....	161
Edmonton Chamber of Commerce.....	162
The Wighton Family .....	163
Alberta Geographical Society.....	165
Ratepayers of Harvie Heights. Committee on Rundle Mountain Strip Mine.....	166
Archaeological Society of Alberta (Calgary Centre).....	168
Alberta Economic Development and Productivity Council.....	169
Submissions From Individuals.....	171
W. Michalsky.....	172
E. Davidson.....	172
A. James.....	173
P.H. Bouthillier and W.L. Bigg.....	173
M. Gawlak.....	174
C. Lacy.....	175
W.M. Schultz.....	176
A.L. Harris.....	177
N. Story.....	179
R.C. Brown and F. Brown.....	180
N. Kvisle.....	181



D.A. Beechinor.....	182
R.F. McBride.....	182
H. Lembicz.....	184
E. Kure.....	184
Supplementary Submissions.....	185
E.W. Stutchbury.....	186
D.A. Hackbarth.....	186
C.R. Chandless.....	186
Alberta Fish and Game Association. Medicine Hat, Alberta.....	187
Canford Engineering Limited.....	187
C.L. Sibbald.....	188
Alberta Fish and Game Association, Zone 2.....	189
P.E. Fuller.....	190
F. Walcott.....	191
R.E. Kelly.....	191
A. Harmon.....	191
Federation of Western Outdoor Clubs.....	192
Central Alberta Big Game Trophy Club.....	193
T. Beck.....	194
J. Burness.....	194
R.H. Carlyle.....	195
R.F. Mountain.....	195
F.C. Marfleet.....	196
Rocky Mountain House Chamber of Commerce.....	196
Sundre and District Chamber of Commerce.....	197
Public Advisory Committee on the Environment. Non- Renewable Resources Study Group.....	198
Public Advisory Committee on Environmental Sciences.....	199
Index.....	201

Digitized by the Internet Archive  
in 2024 with funding from  
Legislative Assembly of Alberta - Alberta Legislature Library



# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA

## INTRODUCTION

ENVIRONMENT CONSERVATION  
AUTHORITY



The Environment Conservation Authority has been requested by the Government of Alberta to consider, through a series of public hearings, the impact of resource development on the environment. The first hearings in the series were concerned with "The Impact on the Environment of Surface Mining in Alberta" and were to consider surface reclamation and the integrity of watersheds.

#### Pre-Hearing Preparation

The Authority provided three documents for the public as background information to the hearings. These were: a prospectus; principles of proposed legislation; a situation report with respect to coal mining.

Considerable effort was put into ensuring as varied an input as possible. On November 16th a press conference was held in Edmonton announcing the dates and places of the hearings, which were:

Grande Prairie, Alberta  
December 13, 1971

Lethbridge, Alberta  
December 15, 1971

Edmonton, Alberta  
December 17, 1971

Calgary, Alberta  
December 21, 1971

Red Deer, Alberta  
January 6, 1972

Numerous environmental or concerned organizations, industries, interested citizens, and all coal mining companies and electrical utilities were initially sent a prospectus on "The Environmental Impact of Surface Mining in Alberta". This paper outlined the present and past state of the coal mining industry, explained some of the environmental concerns, and suggested a number of topics for discussion at the hearings.

As it was the intention of the Government to introduce legislation on surface reclamation in the 1972 Session, the Department of the Environment had prepared a position paper entitled "Principles Underlying Proposed Surface Reclamation Legislation". This was made available to the Authority who in turn provided it to all prospective participants.



A consultant was retained by the Environment Conservation Authority to prepare a situation report for the public hearings. Contained therein was an outline of the environmental problems associated with provincial surface coal mining operations, including exploration, extraction, processing and transport. It should be emphasized that the consultant's report was presented as a situation statement for public discussions, and the Authority does not take the position of necessarily agreeing or disagreeing with any or all of the statements in the report.

#### The Public Hearings

At each public hearing a representative of the consulting firm began the proceedings by outlining the situation report. Individuals and representatives or organizations and companies were then given an opportunity to present briefs on surface mining and/or to talk on the subject. After each presentation members of the Authority directed questions to the individual concerned in order to clarify certain points or to obtain further information. Provision was made at the end of each hearing for a general discussion of the briefs. In total there were eighty-five submissions during the five hearings.

#### Supplementary Submissions to the Authority

The considerable interest generated by the public hearings was evident by the number of presentations at the hearings and by the several briefs transmitted to the Authority by those who were unable to attend the hearings. These briefs were received prior to, during, and for a short time after the hearings; to these were added briefs which commented on aspects of the hearings themselves, bringing the total supplementary submissions to twenty-one.

#### Reports on Hearings

All aspects of the public hearings are documented by the Authority in the forms of Transcript, Proceedings, Summary and Recommendations. The verbatim Transcript of the oral submissions and discussion is compiled from tape recordings of each of the hearings and is available for inspection at the offices of the Authority; it is not reprinted for distribution.

All submissions presented at the hearings, supplementary briefs and letters, and the three pre-hearing reports are included in the Proceedings. This document is available at the offices of the Authority and can be purchased for \$4.00.

This Summary contains a condensation of the consultant's report and each brief presented at the hearings or sent as a supplementary submission. This booklet is a concise presentation of the main points contained in the submissions in order to highlight the thinking of the organizations or individuals. All submissions to the public hearings have been placed into one of four groupings: government and related bodies; companies; associations and organizations; individuals. Additional information is provided with many of the summaries by including some of the questions and answers between the Authority members, Dr. W. Trost, Mr. P. Babey, or Dr. S. Smith, and the speaker. The location of the hearings at which each brief was presented has been indicated in the heading of each summary.

The Recommendations are drafted by the Authority, based on information obtained through the public hearings. These are forwarded to the Minister of the Environment for transmission to the Lieutenant Governor in Council.

# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA

CONSULTANTS REPORT

ENVIRONMENT CONSERVATION  
AUTHORITY





The consultant's report provides a broad outline of environmental problems which might be associated with surface coal-mining operations, including exploration, extraction, processing and transport. A review of the effects of surface coal mining on other natural resources, together with an impact appraisal and suggested general approaches to responsibility for remedial measures and regulatory controls is presented (It should be emphasized that the consultant's report was presented as a situation statement for public discussion and the Environment Conservation Authority does not take the position of necessarily agreeing or disagreeing with any or all of the statements in the report.)

#### Regional Aspects of Coal Mining in Alberta

Three physiographic regions are considered in the report - Mountains, Foothills and Plains, and identify possible environmental impacts with respect to the following:

Mountains - steep slopes, glaciated valleys, sub-alpine forests and alpine tundra, short growing seasons, severe climate and thin, easily disturbed soils; a delicately balanced complex of soil, water and vegetation, with high watershed, wildlife, aesthetic and recreational values, easily susceptible to damage and slow to heal.

Foothills - transition area between the plains and mountains, traversed by numerous watercourses, including several major rivers; watershed, fisheries, wildlife, forestry, range and recreational values high, with susceptibility to damage high, but possibly less than in the mountains.

Plains - flat to gently rolling topography with several ecological types including prairie grassland, aspen parkland, aspen-spruce mixed forest, mixed coniferous forest; farming, ranching, forestry and wildlife resources predominant; susceptibility to permanent damage lower than in the mountains and foothills.

### Exploration, Extraction, Processing and Transportation

The report indicated that coal production in Alberta rose from 4.5 million tons in 1969 to 6.7 million tons in 1970 and was likely to be increased considerably. Coal on the plains is largely sub-bituminous, suitable for thermal electric plants, while much of the coal in the foothills and mountains is suitable for coking coal. Difficulties of mining in steep terrain on the foothills and mountains, plus folding and faulting of seams, make it unlikely that many more surface mines will be developed in these areas in the future. Most, if not all deposits underlying the plains are potentially mineable by surface methods. Although the total area disturbed by surface mining in Alberta is small in relation to the total area of the Province, effects caused by siltation, pollution and transportation may be much larger than the area actually disturbed by extraction. Exploration for coal has, and potentially could, continue to disturb much more surface acreage than actual mining operations.

### Environmental Impacts

Physical and chemical impacts may occur from surface mining activity. Sheet or gully erosion is more likely to occur and to have more widespread effects in mountainous and foothill terrain than in the plains. Erosion and siltation effects can result from (a) exploration (b) actual mining operations (c) exploration roads or coal haul roads. Slides may occur either from slippage of disturbed slopes or from movement of spoil piles. Chemical impacts are likely to be of minor concern in Alberta as coals are low in sulphur. Increased alkalinity or precipitation of iron compounds may be considered as possible hazards to mountain streams. Processing plants pose hazards from waste disposal.

### Protective, Remedial and Restorative Measures

Pre-planning of the total mining operation is cited as the most effective measure in prevention of deleterious effects, in remedial measures if damage does occur, and in reduction of expenditures of labor and capital before exploration and extraction begins, during the mining process and in the post-mining reclamation and abandonment

of mining properties. Of particular significance is the attention which must be paid to drainages, which may be affected by exploration and haulage roads, overburden removal and waste piles. Finally, pre-planning should take into account the eventual necessity for removal of all facilities, such as buildings and processing plants.

In mountains and foothills, pre-planning must take into account the inherent instability of slopes disturbed by road construction and open pits. If reclamation and revegetation is to be successful, the generally sparse topsoil must be carefully conserved, in order that replacement may be effected at minimum cost to the operator, and for maximum effectiveness in permanent restoration of disturbed areas. Slope instability is of minor concern in open pit coal operations on the plains, but pre-planning, including conservation of topsoil, will ensure similar economics and higher probabilities for permanent reclamation in plains operations as those cited for mountains and foothills.

#### Environmental Impacts and Other Resource Use

Integrity of watersheds is related to almost all other resources and their beneficial uses. The prime importance of the Saskatchewan River system to 87 percent of the population in Alberta and 42 percent in Saskatchewan, as well as the importance of the Peace and Athabasca systems to Alberta and northern areas, is listed therefore as one of the highest priority, with respect to surface mining effects. Effects on a variety of related ecosystems may be felt well beyond the actual mining operation. Wildlife may be affected by destruction of habitat, interruption of seasonal migration patterns and behavioral disturbance, resulting in prevention of use of even undisturbed habitat. Effects on fish may be direct, through physical or chemical alteration in water quality, or in effects on invertebrates which constitute food supplies for fish populations. Effects on fish and wildlife have direct consequences on recreational values involved in sport fishing and hunting, as well as on aesthetic, scientific and educational values inherent in undisturbed land. Such effects of surface mining operations are highest in foothill and mountain areas, but also may be significant on the



plains. Forest land may be permanently impaired by significant acreages affected by exploration and haul roads, and grazing areas of importance to the ranching industry may be similarly affected. On the plains, of greatest concern is the potential acreage of land which could be removed from cereal production.

#### Preventing and Minimizing Environmental Impact

Post-mining use of disturbed land should be related to current and projected use of the surrounding area in order that use of reclaimed land compliments adjacent land use. A management plan for reclaimed land should be as important as the reclamation plan itself. Impact studies should consider climate, topography, drainage, soils, vegetation, fish and wildlife, access, human interest areas, settlements and resource use patterns. Management plans will not be effective unless properly supervised by personnel trained and experienced in each phase of the operation, from exploration through extraction, processing, shipping and eventual abandonment of the mine site.

#### Reclamation

As stated earlier, successful reclamation of surface mine sites is heavily dependent on pre-planning. Actual site preparation for reclamation involves grading, back-filling, soil replacement, drainage and preparation of an adequate surface seed bed. Revegetation is the primary objective in the shortest time, in order to prevent erosion from wind or water, and to minimize slippage of surface materials. The requirements will vary according to the effects of topography, slope, altitude, precipitation and surface characteristics. In general, establishment of vegetal cover will become progressively more difficult from the plains through the foothills to the mountains, and from south to north. Proper reclamation can lead to better land use than before mining on the plains.

### Benefits and Costs of Surface Coal Mining

Data on past or present surface mining operations are not included in the report; thus benefit/cost comparisons are on a theoretical basis. Direct benefits are identified as direct payments to land, labour and capital. If profits are sent out of Alberta, payments to non-resident capital are not benefits. Direct costs of using land, labour and capital are "opportunity costs", or earnings they could command in another use, such as for cereal production, grazing, forestry, recreation, etc. Creation of jobs are direct benefits only to Albertans who would be otherwise unemployed. Similarly "multiplier" or secondary effects likely would be as great if the land, labour and capital resources were used in some other industrial activity. Benefit-cost analysis is useful in providing choices of activities. Early analysis tended to overlook ecological, recreational and aesthetic values, but these are now being included. Royalties, wages and profits are relatively easy to assess, but ecological, recreational and aesthetic values are more difficult to measure, as is the depreciation of Crown land. Opportunity costs of land labour and capital can be assessed as can depreciation in value of private land. Without substantial economic data, it is difficult to measure the direct and indirect benefits and costs, but in making decisions all known economic variables must be considered. Because it is impossible to include quantitative data on some effects of surface mining, subjective decisions must be made as to whether the social costs and risks are offset by the benefits. If there is no way of preventing undesirable social costs, and the public is unwilling to accept such costs (such as the impairment of water quality in a large river system), the choice may be to prohibit that particular operation.

Responsibility for the costs of remedial measures rests with the company causing the problem. Beyond the point of profitability the company has the alternatives of (1) closing down, (2) increasing efficiency of operation, (3) reducing royalty payments or environmental standards. The third alternative is not acceptable unless the social benefits exceed social costs, such as creating the only employment potential in an area.

### Recommendations and Guidelines

The consultant's report listed several recommendations, chief of which suggested that conflicts of resource use should be resolved within the confines of land use policies and defined land management zones, and that these apply equally to Crown and to private lands. Review of applications for coal operations, plus use of legislation and regulations should be flexible, in order to accommodate the wide variety of operating conditions which will occur. A number of Federal and Provincial acts were listed which might apply to coal mining operations, in order to point out the broad scope of interest in surface mining operations. It was suggested that management plans, submitted with applications for operations, should describe the nature, extent and environmental impact of the operation; measures should be stated which would lessen the environmental impact, the projected use after mining and measures proposed to achieve that use should be included in the management plan. Mechanisms should be provided for continuing dialogue between operators and regulatory bodies. Qualified inspectors should be employed to supervise all stages of operations, including the monitoring of environmental impact and reclamation procedures conducted by the operators.

Future activities were suggested in the following areas:

- (1) Accumulation of primary statistics which should be published.
- (2) Coordination of reclamation research and trials, between the industry and government and between operating companies, in order to avoid duplication and to provide a fund of knowledge.
- (3) Establishment of acceptable standards for watershed integrity and water quality, as well as for fish and wildlife requirements.
- (4) Initiation of ongoing economic studies, to provide a readily available base for decisions affecting the coal industry and other resources.

### DR. TROST

You made reference to the acreage on the plains that has already been opened by strip mining practices. What is the rate at which this acreage would now be opened if three million tons per year were strip mined from a six-foot or so seam?



MR. WEBB

We mentioned that there were 1.2 billion tons of measured coal resources in the plains region. Rates seem to vary from 1,000 to 10,000 tons of coal per surface acre but there can be extremes outside of that. Using these figures, between 300 and 3,000 surface acres are likely to be disturbed, given the same rate of exploitation over the next few years.

DR. TROST

What is the amount that has been disturbed to date?

MR. WEBB

We estimate less than 10,000 acres.

MR. BABEY

Mr. Webb, do you have any figure on what percentage of this has been reclaimed?

MR. WEBB

No. As far as we could determine from government and other representatives, a good usable set of statistics of this kind is not available.

DR. TROST

You made reference to the desirability of cost-benefit analysis and reaching judgements on these matters since there are always two sides to look at. In applying these methods in the prairies, is the length of time that the land is taken out of productivity and the increase or decrease in the productivity after reclamation all part of the cost-benefit analysis?

MR. WEBB

Yes. Those are two very important considerations.

DR. TROST

Can you contrast cost-benefit analysis in the prairies as against the mountains, indicating whether reclamation is feasible and what the particular difficulties may be against that feasibility in both cases?

MR. WEBB

It is a much simpler process in the plains region simply because reclamation procedures are better known or easily put into practice at less expense. Problems in the mountains and foothills regions associated with reclamation tend to be more acute. At higher elevations, revegetation

of areas above or at timberlines is in fact an extremely difficult and expensive procedure. The movement of overburden and the contouring of land preparatory to revegetation in the mountains is an extremely costly process, if in fact it can be done at all. Because these procedures are more difficult and hard to cost in advance the cost-benefit analysis approach is much harder to put into practice in the foothills and mountains.

DR. SMITH

Your written report clearly indicates a multi-discipline approach to the problems we are discussing at these hearings. Do you see any difficulties in integrating the kinds of discussions from private consultants, government and industry, that will be productive in effecting good reclamation? Is it being done now? What are the prospects?

MR. WEBB

I think the degree of cooperation between responsible government agencies and the mining companies is improving rapidly. However, there is much room for improvement. I would suggest that there are great, but not insurmountable, difficulties in bringing about this kind of approach. One of the greatest difficulties I think is the total absence of a land use plan and a good zoning policy to cover all the areas in which coal formations exist.

MR. BABEY

You mention that the chemical problems here are not as severe as they are in other parts of the world. What about strip mining in the plains area and the difficulties that one might encounter in terms of the water supplies?

MR. WEBB

This was really beyond the scope of our study, and we recommend additional study. The chemical problems to which I refer are those that are associated with high sulphur content in soil. The sulphur content is not that high in Alberta and, therefore, the sulphur problem is not as great as it is in the eastern United States. In the mountains and foothills there may be problems of iron precipitate and alkalinity.





# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA

SUBMISSIONS FROM  
FEDERAL GOVERNMENT AGENCIES, CITIES,  
COUNTIES, PLANNING COMMISSIONS  
and COUNCILS

ENVIRONMENT CONSERVATION  
AUTHORITY



CANADA. NATIONAL AND HISTORIC PARKS BRANCH OF THE DEPARTMENT OF  
INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

MR. R.P. MALIS      CALGARY

The National and Historic Parks Branch is responsible for the administration of the National Parks which are "dedicated to the people of Canada for their benefit, education and enjoyment" and are to be "maintained and made use of so as to leave them unimpaired for future generations". The brief stated that an integral part of the responsibility of the National and Historic Parks Branch is to ensure that development outside park boundaries are compatible with the natural resources located inside the boundaries. The position of the Branch on the question of strip mining recognizes that a healthy economy is vital not only to the survival of Canada but also to the continued existence of the National Parks. Essential to such an economy is the wise utilization of resources, including subsurface minerals. As a result, the Branch is not opposed to the principle of strip mining.

The increasing number of visitors to National Parks has created over-crowding problems, particularly in the three mountain parks in Alberta. There is obviously a limit to the services which can be provided without impairment to these parks. The Branch therefore welcomes establishment of recreational facilities by private developers outside, and adjacent to existing park boundaries. The Branch has done some studies on the economic benefits of tourism. These returns calculated over a long period often indicate social and economic benefits superior to those to be gained from some types of environmentally destructive resource exploitation. Areas along access routes, such as the Canmore Corridor, are ideally suited for recreational development, assuming that an attractive natural setting is maintained.

It is desirable from the National Parks point of view that access corridors from major regional cities to the parks be kept in as natural a state as possible, particularly if the corridor could be developed for recreation. The Province of Alberta has already recognized this critical

relationship of recreation to park values, in calling for close cooperation by means of a continuing committee of all three levels of Government to integrate our various park plans.

The National Parks Branch agrees with the proposed legislation described in the position paper by the Province, since we have common goals as well as common problems. Road construction, sand and gravel operations, sanitary land fill and waste burial are becoming more and more serious problems in the National Parks. With the obligation to maintain the parks "unimpaired for future generations" new areas must be found outside park boundaries for borrow pits and waste disposal. In this regard, the same kind of study and precautionary measures dictated in the proposed legislation for strip mining will be called for. If the Province finds it desirable, the National Parks Branch would be pleased to participate in any studies undertaken with respect to plans for land use near or affecting national park areas. The National and Historic Parks Branch is ready to provide professional and technical personnel to assist in evaluating the ecological and environmental factors involved in any studies in which it might be asked to participate. Specifically, the Branch is interested in a combined impact study on the possible development of the Dog Rib Creek deposit on the Panther River drainage adjacent to Banff National Park and the Cadomen Mountain Park deposit just east of Jasper National Park.

National parks are integral units figuring in the economy of their localities and the Province as a whole. Their protection is as much of a necessity to Municipal and Provincial Governments as it is to the National and Historic Parks Branch.

DR. TROST

You made a comment on the need for buffer zones in certain circumstances. Is one mile an adequate buffer zone for your purposes?

MR. MALIS

It would depend on the scope and scale, the form of development and the sensitivity of the area and vicinity of the park. In some cases I do not think it would be adequate. Many of the wildlife migratory patterns, elk for example, would certainly go outside a one mile zone.



DR. SMITH

Substantial numbers of wild animals summer in the National Park and winter in Provincial territory. Has the Canadian Wildlife Service completed studies or plan to do studies on the impact of this kind of resource use on those animals?

MR. MALIS

There are specific studies going on concerning very detailed resource inventories of all the natural resources in a National Park. This will provide valuable information that you require.

CANADA. DEPARTMENT OF ENVIRONMENT

MR. G.H. DRINKWATER

CALGARY

A. Basic Economic Analysis of the Coal Mining Industry in Alberta.

1. From the viewpoint of the mining industry, surface techniques offer real advantages: a) they make possible the recovery of deposits which, for physical reasons cannot be mined by underground methods; b) they provide safer working conditions; c) they usually result in more complete recovery of the deposits; and d) most significantly, they are cheaper in terms of unit costs.
2. Albertan benefits are for the most part measured by direct and indirect employment opportunities, revenues generated for provincial and local governments, and the kilowatts of low cost electricity which provide a source of energy for homes and businesses.
3. Coal mining is not a labour intensive industry.
4. Allocation of areas for industrial activity in combination with other land-uses can be effectively determined by sound and unbiased planning which considers equally all resources, whether quantifiable in economic terms or not.

B. Coordination of Surface Coal Mining, Environmental Protection and Reclamation.

1. Before there is any development for coal or other minerals in a particular region it should be determined whether there is some other over-riding land-use for which the area is better suited, and whether that use would preclude or limit surface disturbances.
  2. All land is watershed and to some degree aesthetic and most lands support wildlife. Some land contains fish habitat and some has commercial value for timber or agricultural crops.
  3. Ground water flow patterns can be disrupted by strip mining.
  4. Coal-bearing areas include lands that support aspen and/or grass-land vegetation. In western Alberta these are productive and critical ranges for numerous big game and upland game bird species as well as many equally important non-game species. The streams and lakes of western Alberta abound in a rich and varied aquatic fauna including a diverse and abundant fish population. Numerous fur-bearing species are located within the coal-belt as well as several rare and endangered wildlife species.
  5. Wild ungulates are forced to winter on 10 percent or less of the total mountainous area, with many winter ranges supporting wild ungulate densities of 25 to 100 animals per square mile of range.
  6. Requirements for industrial participation in impact studies and operational research in Alberta would hasten the development of environmental protection and reclamation methods.
- C. Environmental Protection During Surface Exploration and Mining for Coal.
1. Since both physical and chemical water quality will be affected by surface mining, a water quality monitoring and control program is an integral part of environmental protection during surface coal mining.
  2. The water quality parameters most commonly altered by coal mining are suspended solids, turbidity, color, iron, manganese, organic carbon, nitrates, phosphates and alkalinity.
  3. Small lakes are quite vulnerable to accelerated eutrophication and need protection from sediment and inorganic chemicals that can leach from the surrounding land when it is disturbed.
  4. The prime way of combatting soil erosion is by keeping the area of disturbed, unvegetated land to a minimum.

5. The preferred technique for producing mass stability and a suitable topography of surface mined land is to backfill as many pits as possible with overburden from other areas.

#### D. Reclamation Procedures.

1. Proper overburden management yields a stability and topography that is suitable for revegetation in accordance with the land-use objectives of the reclamation plan.
2. Slopes greater than 50 percent are very difficult to revegetate with present techniques, although slopes of 60-70 percent do occur naturally and can have a stable vegetative cover. Further research is required to determine if short (approx. 100 ft.), steep (60-70 percent) slopes can be surface stabilized effectively and at a cost that is less than that of grading to a 50 percent slope.
3. An effective way of removing the highwall from the landscape is to form a lake in the adjacent pit, but this requires a suitable surrounding topography and water supply.
4. A rough surface provides more protected micro-sites for seed germination and seedling establishment than does a smooth or packed surface.
5. Revegetation should be considered a two-step operation. The first step is establishing a ground cover of grasses and legumes to control erosion and act as a nurse crop for secondary vegetation. The second consists of a gradual change of the vegetative cover toward those species that best meet the land-use objectives of the reclamation plan.
6. The choice of species and establishment techniques for a given location cannot be generalized and they are best determined by vegetation surveys of nearby undisturbed and disturbed land, operational research trials and well chosen land-use objectives.
7. Portions of streams within the "active mining center" that were frequented by fish prior to mining and have deteriorated due to mining, must be reclaimed to reform spawning grounds and provide protection and food for fish.



8. The creation of small lakes may be a part of the reclamation plan, or existing lakes may deteriorate due to surface mining and associated water use. Therefore, a lake improvement project may be necessary.
9. When the land-use objectives of the reclamation plan include recreation or visitor-use, then facilities should be provided for: viewpoints, boating, swimming, fishing, camping, hiking, hunting, skiing, or other outdoor activities that are consistent with the amenity values of the area.
10. Each reclamation plan is unique. Operational research and pilot reclamation programs may be necessary to project the total reclamation costs over several years for a surface mine of hundreds of acres.
11. Since reclamation of mined out areas should proceed during active mining of other areas, reclamation costs can best be viewed as part of the operational costs of the mine as a whole rather than a debt to be paid in the future.

E. Environmental Impact of Related Surface Disturbances.

1. Care should be taken to backfill, contour and revegetate all quarries, pits, and other small land disturbances that are visible from scenic routes.
2. Most of the statements made in this brief apply to tar-sand extraction operations but they do not cover the hydrologic and chemical complexities of the problem. Research should be initiated immediately to assess the full environmental impact of this industrial development.

F. Recommendations for Proposed Surface Reclamation Legislation.

1. A general feature of these recommendations is that the legislative approach to reclamation should be preventative rather than punitive.
2. Any statute to provide for the reclamation of surface disturbed lands must begin with a clear statement of purpose, policies and goals.
3. The proposed legislation should avoid a restrictive definition of "reclamation". The full range of potentially deleterious effects should be considered, such as damage to vegetation, wild-

life habitat, land surfaces, soil, water bodies, aquatic habitats, hazards to public health and property, or reduction of aesthetic and historical values. Reclamation should be viewed broadly to include the amelioration or prevention of any of these deleterious effects.

4. Consideration must be given to a statutory provision that requires all agencies concerned with reclamation planning to identify and develop procedures that "ensure that presently unquantified environmental amenities and values are given appropriate consideration in decision-making along with economic and technical considerations".
5. Two levels of regulations are recommended: those that are applicable to all forms and all geographic locations of surface disturbances and those that are applicable only to particular sites within designated "land management zones".
6. Particular attention must be given to regulations that would minimize environmental damage both during and immediately after the mining operation.
7. Legislation should ensure that the burden of proof in respect to establishing environmental protection rests upon the party creating the surface disturbance and not upon the enforcement agency. A report from the company should include proposals for operational studies to be carried out during the first year of the permit.
8. It is recommended that there be a review of statutory mechanisms that would allow reclamation to be undertaken by either the permit system or the contractual agreement.
9. If a legally definable boundary were adopted, there would need to be provision for some form of dual jurisdiction to allow separate administration of regulations within and outside a legally definable "centre of operations".
10. The purposed statute could define the circumstances for which a public hearing would be mandatory.

CITY OF LETHBRIDGE

MR. J.A. HAMMOND

LETHBRIDGE

The opening statement in the City of Lethbridge brief was as follows:

"The City of Lethbridge desires to be recorded for the purposes of this hearing as being strongly opposed to any activity which may environmentally effect the watersheds of the Oldman-St. Mary River systems." The City of Lethbridge brief referred to a report of the City Manager made to City Council on October 25, 1971 concerning flows in the Oldman River. The report stated that the required amount of flow on the Oldman River necessary to safeguard the future growth and development of the city is 18,250 acre feet or 25 cu. ft. per second, which the city is allowed to take under license. The report went on to state "It really does not matter how much the city or the irrigation districts or all other users of water from the river are allowed, if there is not sufficient water in the river to guarantee these needs to a point within the foreseeable future. This then, becomes a principle problem - to guarantee sufficient water to meet all essential needs according to the priority schedule mentioned earlier in this report".

The brief went on to state that the City of Lethbridge envisions a water shortage, not only to it as a municipality, but to the region and specifically to the two irrigation companies operating in Southern Alberta. Anything which may in any way interfere environmentally with the city's water supply is to be objected to most strenuously.

The city brief expressed several concerns with respect to coal strip mining operations on the Oldman River watershed. Of major concern was the water retention capabilities of the upper drainage areas.

Of concern also is the problem of erosion and siltation associated with plant removal and with the materials which might be deposited into river water drainage due to run-off from strip mine operations. The brief cited problems which have arisen from the operation of Kaiser Resources Limited at Natal, British Columbia, the Coleman Collieries operations on the head waters of the Oldman River, the Estavan-Bienfait area in Saskatchewan, the Gulf and Shell sulphur extraction plants at Pincher Creek,



Alberta, and the industrial wastes which have been put into the North Saskatchewan River. The brief expressed concern that these examples might be repeated in Alberta to the detriment of use of river waters for recreation, irrigation or for drinking water.

Concern was expressed about the loss of recreational area through strip mining activities, not only for its own city population but for the growing population of the Province as a whole and for the population south of the international border. Reference was made to a report prepared by the Oldman River Regional Planning Commission on the Crowsnest Pass sub-region. It was estimated in this report that the Banff-Waterton area had an estimated 5 million tourist visits. The report stated that "Where there has been coal mining in the Crowsnest area, the area is blighted and there had been no serious attempts made for tourist development." It was further suggested that the National Parks are at or near saturation with respect to tourist usage, and that mountain and foothills areas adjacent to the National Parks will become increasingly more important for tourism. Figures were cited to indicate that Southern Alberta "has experienced a 23% growth of tourism in 1970 and 26% in 1971". The report also noted that the tourist industry is highly labour intensified, employing the third largest number of people of any industry in the Province of Alberta. It was stated that a much greater return ultimately could be expected from the tourist industry than from the surface coal mining industry, and that tourism and recreation are not compatible with surface or strip coal mining.

In summary, the City is not opposed to development and industry in its area, but is opposed to that type of development which may be incompatible with those presently existing, such as irrigation, farming, tourism and recreation, and with the future growth of the city.

DR. TROST

Would you care to comment further with respect to water quality and the quantity of water available to Lethbridge and to Southern Alberta out of the Oldman River watershed area?

MR. HAMMOND

We know that there will be a growing demand on the existing water supply. Therefore, any interference which may affect that future supply certainly has to be questioned. In planning today we should take those factors into consideration, and it would certainly appear that there will be a conflict of interest in respect to water for the future.

DR. TROST

If the coal in the mountains were taken out by underground methods would that affect the conditions you are complaining of?

MR. HAMMOND

I think that we have found that this in the past has been fairly compatible and I think that this would be desirable and we could accept it.

CITY OF RED DEER

MR. R.E. BARRETT, MAYOR.

RED DEER

The brief pointed out that the City of Red Deer is important to the area because it is situated in a well developed farming district which contains many recreational attractions of great importance to tourists. The City has been active in environmental protection, having installed in 1961 an anaerobic lagoon for sewage treatment; a secondary sewage treatment plant is now under construction and fresh water treatment facilities are being expanded. Of great concern to the City are any changes in water quality occurring upstream, through mining or engineering works. It is the opinion of the City that strip mining, road works or other projects should not be developed in the upper reaches of the river west of Red Deer without the benefit of an overall concept or master plan.

DR. TROST

Has the quality of the water been affected by resource development to the east?

MAYOR BARRETT

We are not sure as to whether it is resource development, but there is

something west of Red Deer that does affect the quality of the river, particularly the dissolved oxygen content.

DR. TROST

Has the quantity of water or the rate of flow of water been affected by resource developments to the west?

MAYOR BARRETT

We have been concerned about this for some years and have made several representations to the Provincial Government; all we have received from them is an assurance that they are concerned and they had made some preliminary studies.

MR. BABEY

You mention that the flow has been reduced substantially in the Red Deer River. Have there been any studies done indicating whether there has been a progressive decrease?

MAYOR BARRETT

I would think that the records produced by the Provincial Department would indicate this. Our Engineering Department has records available that would tell that story.

#### COUNTY OF PAINTEARTH

MR. GUY TOMILSON

RED DEER

Mr. Tomlinson indicated that the Council of the County of Paintearth was aware of the benefits of the operation of strip mining and the production of electrical power within the county boundaries. At the moment, the two industries operating almost equal the complete assessed value of the farmland within the county. The Council did not want to take any position which would interfere with the complete development of mining and electrical power production but felt that it was also an essential part of the operation to see that reclamation was carried out after mining was completed. It was pointed out that there are examples of operations carried out thirty years ago where there are still open pits and barren piles that have never regressed themselves naturally. The pits have areas of blocked water and are a hazard for stock and for people.



The brief pointed out that the people who did the original strip mining are either gone or dead and that the companies are bankrupt. There is thus no possible way to repair the damage that was done by collecting from those responsible. The County of Paintearth feels that reclamation should be paid for from the proceeds of the coal mining operation. The brief recommended that with regard to coal mining and reclamation, provision be made for funds which would be available to repair damage. It was suggested that with good reclamation the land could be put back into full productivity, and Council supported the suggestion that there should be legislation to ensure that reclamation was properly carried out.

A study of multiple land use problems in the northwest corner of the County of Paintearth #18 was carried out for the Council of the County of Paintearth by the Red Deer Regional Planning Commission. The Environment Conservation Authority requested that permission be given to the Authority to include a summary of the Red Deer Regional Planning Commission study in its study of the Red Deer Hearings. This permission was granted by letter dated February 18, 1972 from the Red Deer Regional Planning Commission, indicating that the Council of the County of Paintearth had no objections to making the report a public document. A summary of the Red Deer Regional Planning Commission's study in the County of Paintearth is appended as follows.

#### SUMMARY

The area as studied by the Red Deer Regional Planning Commission is the extreme northwest corner of the County of Paintearth, consisting of gently rolling to undulating prairie, bordered on the north by the Battle River and on the south by Paintearth Creek. The relatively dry climate, with large diurnal and annual temperature extremes inhibits rapid growth of vegetation on soils with agricultural capabilities of three through seven, according to the Canada Land Inventory ratings. As a consequence, agricultural yields are relatively low when compared to other areas in Southern Alberta, although farming is a viable activity in the area.

Shallow coal seams underly the area, while the wooded slopes and

bottom lands along the river provide some of the better recreation spots in the region. Thus, agriculture, strip mining for coal and recreation are major land uses. Availability of inexpensive coal and also of water from the Battle River made possible construction of the Canadian Utilities Power Plant during the mid 1950's. As a result, land tenure is divided between private individuals, companies and the Crown.

With a mixture of land uses, problems of conflicting resource demands have arisen. Conflicts between recreation use and other land uses are minimal, because Big Knife Provincial Park is situated on lands comprised of excessive slopes and of bottom lands of limited agricultural utility. The mines have had little direct effect on the park although they do depreciate the aesthetic quality around it and have damaged some coulees which could function as good game habitats. Some of the coulees could be reasonably restored although not necessarily inexpensively, for use as game habitats and fish ponds. The existence of industry has aided the recreation values of the area since the reservoir has increased the recreation capabilities of this section of the Battle River Valley.

To date agricultural and mining activities have existed with real conflict. Stripped lands have not been reclaimed to a standard which is sufficient for reutilization, whether it be for recreation or agricultural periods. Recently experimental work has been carried out which has resulted in some old spoil piles being bulldozed into rolling contours and attempts to revegetate levelled land will come soon. However, much of the stripped area presently consists of unreclaimed parallel ridges of spoil piles with gulleys between them. Revegetation has taken place in some areas, but excessive slopes and water hollows are not conducive for the land to be used for pastures. These areas could be reclaimed and made useable.

Strip mining is the most economical and least hazardous method of mining for coal but without concern and preventive action it is also the most harmful to the environment. Without reclamation, productive farm land is being lost, which poses a potential loss of assessment to the municipality. It is feared that mining activity will intensify and spread onto the surrounding good arable soils. Now is the time to ensure

that adequate reclamation controls are employed to ensure that strip land is reclaimed to a high standard.

A number of Provincial acts and regulations are related to surface reclamation, the most direct being the Surface Reclamation Act. This act has basic inefficiencies in reclamation control but the Government appears to be taking steps to rectify this. The Planning Act can also be used by a municipality to control the modification of land surfaces. It can be said that all parties, including the Provincial Government, County Government, coal companies and the public, are interested in good reclamation being achieved. Some wish immediate action and sophisticated practices while others desire planned advances at minimized costs. It seems important to obtain a sound and beneficial medium between these two poles.

The Canadian Utilities power generating station is economically advantageous to the municipality but has stimulated more intensive strip mining activity immediately adjacent to the power plant. The intensification of strip mining is causing concern about the loss of productive land deterioration of the environment. This concern is justified, because reclamation of stripped lands has proved to be inadequate, with none of the work land restored to a standard capable of allowing reuse of the land for agricultural and recreational purposes.

It is not suggested that strip mining should be halted or even deterred. Strip mining has too many advantages, including health, safety and economic benefits, over the alternate method of deep mining, to preclude it's discontinuance. Conflicts between strip mining and agricultural use can be minimized so that strip mining and farming can exist in harmony. This depends, however, entirely on the quality and type of strip mining techniques and reclamation standards. In the area studied neither of these has been sufficient to conclude that a real conflict does not exist. It is understood that time and experimentation is required in order to gain knowledge and the ability to reclaim the land adequately. Localized problems may complicate reclamation procedures but land in a study area can be reclaimed more easily than other land surfaces and sub-surfaces. It is imperative that an orderly reclamation plan be made, such that reclaimed land can be productively re-utilized within a reasonable

period of time. Immediate reclamation of stripped land is advantageous, because it turns land back into production much sooner than when it is left, thus providing additional social and environmental benefits.

High standard reclamation is economically advantageous to coal mining companies and to society. Money used for reclamation could be invested elsewhere but investments in reclamation will return societal benefits which more than equalize any returns from alternate investments. Reclamation need not require economic justification alone, when benefits to society and the environment can more than offset any financial concerns. Immediate reclamation is enhanced by the use of stripping procedures which minimize time and costs required to reclaim land. Procedures should be designed to create a pattern of spoil piles and over-burden distribution which minimizes the amount of work required to grade the work lands into an undulating plain with a pre-planned drainage pattern and settling pond area. The final surface should consist of the nutritious portions of the soil horizon so that problems in reconditioning, seeding and planting are minimized. Where existing soil quality permits, all newly stripped areas should be reclaimed for agricultural use. If soil quality does not permit this, then the stripped land could be reclaimed for recreational purposes by turning the land into game bird sanctuaries, fish ponds, etc.

Cost of reclamation will be borne by the market, and not the supplier of the coal. The higher the reclamation standard, the greater will be the operational costs and consequently the higher the price for coal. The largest eventual market for coal in the study area will be thermal plants which feed the grid from which people purchase electrical power. Therefore, people throughout the province will individually contribute a small portion toward paying land reclamation costs in the study area. Assuming \$600.00 per acre for reclamation costs and 8,000 tons of coal per acre, it would take an additional 7.5 cents per ton of coal to pay for the reclamation of an acre of land. Distributed throughout the province, this increased cost seems minimal. Social and environmental benefits outweigh the increases in costs and therefore a high standard of reclamation should be carried out. If the province and its citizens desire development, as well as to maintain their environment then they will have to pay for it.



From the research and conclusions of this study, it is apparent that the Provincial Government should enforce land reclamation and restoration using provincial-wide standards, safe-guards and stimulants in order to ensure continuity throughout the province. If new regulations are felt to be inadequate by the County, then they should not hesitate to pass zoning bylaws which contain sections that will regulate surface reclamation as they see fit. All companies should pre-plan their stripping methods to enhance reclamation. This plan should be submitted for approval before development is allowed. A performance bond should be posted by the Company to ensure reclamation to required standards. The amount of the bond should be equal to twenty-five to fifty per cent of the cost of reclamation. All areas of number five soils or better should be reclaimed for use as pasture land. Areas with poorer soils should be reclaimed for recreation. Land along the escarpment of the Battle River should be left untouched to protect slope stability, since alternate areas are available for mining. County roads should not be disturbed. The Authority should work closely with the mining company and reclamation experts should be employed to ensure validity of plans.

DR. TROST

Would you elaborate on the benefits that come to the County through strip mining? What proportion of that tax base is related to the strip mine and what proportion to the power plant?

MR. TOMILSON

The power plant has the largest part and the actual machinery in the plant is a large valuable asset.

DR. TROST

Do you believe that if one were to start with good farm land, take the coal from underneath, that it could be restored to good farm land?

MR. TOMILSON

I do not believe it will ever be good farm land again. That is not very productive in the tax field. The production from this particular unit of land for coal is far greater than any agricultural production over a period of many many years but it is a sudden production.

DR. TROST

When do you foresee this to be an important detriment to the County?

MR. TOMILSON

It would take many years before it became a large burden on the tax base.

PEACE RIVER REGIONAL PLANNING COMMISSION

MR. GRAHAME ALLEN

GRANDE PRAIRIE

Within the area of jurisdiction of the Peace River Regional Planning Commission lie mountains, foothills, and part of the Wilmore Wilderness Park. The area contains extensive coal deposits, some of which are presently being strip mined. Parts of the eastern slopes of the Rocky Mountains (northwest of Grande Cache) are virtually unpopulated, natural areas with tremendous wildlife, recreational, and tourist potential. It also likely contains vast mineral, gas and timber reserves.

A joint brief was prepared by Alberta and British Columbia Planning Commissions and presented to Cabinet representatives of both Provinces. It proposed that the Provincial Government consider reserving an area of approximately 2750 square miles in British Columbia and 500 square miles in Alberta for an 18 month period to allow time for a resource planning study. Following the study realistic boundaries should be established for various land uses including recreation and conservation areas. There were indications from both the British Columbia and Alberta Governments that comprehensive land use and resource allocation studies would be undertaken in the area.

The Planning Commission members agree that resources must be developed, however, such development must not occur at the expense of the environment. Adequate protection of Alberta's environmental resources depends to a considerable extent on similar protective measures developed in British Columbia. It is therefore suggested that the Authority encourage the Province of British Columbia to take appropriate measures to ensure that water courses originating in that Province and flowing into Alberta are not in danger.

DR. TROST

Do you want to summarize for us the principle points of concern that the

Planning Commissions on both sides of the border have in the matter?

MR. ALLEN

The principle points of concern are that if joint land uses are going to occur in this particular area, in other words if we are going to have mining industry taking place down there, we feel that it must be done in such a way so as not to interfere with the social, recreational and wild-life potential of the area. We have spoken to people involved in industry and they tell us that this can be done.

BRITISH COLUMBIA, PEACE RIVER-LIARD REGIONAL PLANNING DISTRICT

MR. DIETER F. HOLLURAUS

GRANDE PRAIRIE

The Peace River Regional Planning Commission of Alberta and the Peace River-Liard Regional District Planning Commission worked together on a resource planning study for the Monkman-Kakwa area. The study outlined four areas within the Peace River-Liard Regional District:

1. An area of approximately 240 square miles taking in Kanuso Falls and Monkman Falls.
2. One hundred square miles joining the Wilmore Wilderness and Kakwa areas in Alberta and including Kakwa Lake, Cecelia Lake and Babbott Lake.
3. A small area including Wapiti Lake and Onion Lake.
4. A small area around Hoot Lake.

Our study outlined on a map the areas above timber line, steep slopes, oil and gas leases and coal leases. All of these leases were excluded. At least one forestry company in Alberta and one in British Columbia had no objection to the proposals.

OLDMAN RIVER REGIONAL PLANNING COMMISSION

MR. J. NICHOLSON

LETHBRIDGE

It is assumed that the extraction of minerals by surface mining

will continue to play an important role in the economy of this province. In this regard there are implicit conflicts in land use, and economic imperatives must be reconciled with environmental concerns, considering the following factors:

1. Cultural Values - environmental standards appropriate in the 1970's and beyond.
2. Economic Limitations - additional (or marginal) costs of extracting minerals in order to avoid unacceptable and environmental damage.
3. Environmental Planning Studies - potential uses of a given region and the extent to which it can tolerate abuse by man.
4. Implementation of Programs - legislative and administrative mechanism which will assist in the achievement of designated land use goals.

The brief focused on problems of implementation of programs in the context of regional planning.

Society's cultural values reflect acceptable levels of environmental abuse. As a consequence, there is a re-assessment of the relative costs and benefits of alternative land uses. Where surface mining is concerned a comparison of the costs and benefits of mineral extraction versus recreational and conservation uses is particularly relevant. Where rare and unique ecosystems are involved it seems to be the consensus that reclamation of the land should be insisted on. There is considerable evidence that the expense of reclaiming strip mined land need not be prohibitive. Estimates of reclamation costs vary between 2¢ and 25¢ per ton of coal extracted, but if reclamation is done after mining rather than concurrent with it the dollar costs are two to three times higher.

Environmental planning studies involve prediction and assessment of the impact upon the environment. Extensive planning-oriented research of a region and its resource potential are necessary to provide the data upon which informed land use decisions can be based. It is possible to predict environmental effects of alternative land use and to relate these to social and economical values.

Introduction of new legislation permits more comprehensive control of resource uses and the brief supports the proposed legislation outlined



by the Department of the Environment. Consequently, the following results may be anticipated:

1. The promotion of balanced resource use.
2. An emphasis on the prevention of further environmental damage.
3. Placing the onus on the developer to prove his proposed activities are acceptable.
4. Resource use decisions to be preceded by public debate.
5. All affected agencies and departments to be involved in administrative decisions.

Of importance to the fifth point is Alberta regional planning legislation. Regional planning creates a framework through which there is anticipation of problems rather than reaction through crisis.

A well established role of a planning agency is to collect, review and comment on the reactions of the public and private sectors to decisions on land use, and to disseminate this information to those responsible for particular land use decisions. It is a legitimate function of a regional planning commission to review any surface mining or land reclamation proposals. The environmental impacts of surface mining are likely to be regional in scale and for these reasons a regional planning agency should have a key role in the administration of any new legislation.

The introduction of new, legal and administrative ground rules will help to optimize the mix of land uses and resource allocation. Further compartmentalization of jurisdictions and agencies involved will prevent implementation of the legislation. The potential effects of surface mining are too diverse, too persistent, too complex and too overwhelming in their impact on the environment for its regulation to be relegated to a single government department or public agency. Activities of the agencies involved should be coordinated through the mechanism of regional land use planning.

DR. SMITH

The role of the Planning Commission, as I understand it, is to adopt a completely neutral stance, and to draw points of view in focus before any recommendations are made.

MR. NICHOLSON

I would say that was the case. It is to draw together all points of view and to disseminate them to those who have to make the decisions. I think

there is an increased awareness of a need for a regional outlook and a regional point of view.

#### PROFESSIONAL STAFF OF THE RED DEER REGIONAL PLANNING COMMISSION

MR. R. CUNDY and MR. W.G.A. SHAW

RED DEER

The comments and recommendations contained within this brief may parallel the feelings and thoughts of member municipalities but do not necessarily represent their opinions; the brief must be considered as a positional paper of the professional staff of this Commission. The planners are very interested in the condition and quality of the present and future environment of the Province of Alberta.

#### Situation Statement

Economic development in Alberta should be encouraged but it should not occur as a detriment to the environment. Since strip mining activity should intensify to meet energy demands, strong positive reclamation controls will be required. Strip mining should be used except where unrepairable environmental damage would occur.

#### Staff Observations on Current Strip Mining

Invariably strip mining operators have had, at some time or another, poor reclamation records; this is the fault of both the operator and of governments. The public are now demanding resource conservation and reclamation practices; industry is becoming more aware of this. Strip mining operations in Alberta can be classified into two areas of activity, the prairie region and the other is the uplands. Problems in the upland areas are more severe. In the Halkirk coal field on the land immediately south of the Battle River approximately 50 acres of land per year are stripped. Although reclamation experiments have taken place, none of the experimentally reclaimed areas are suitable for reuse.

#### Surface Reclamation Act

There are several basic inadequacies of the Act, some of which are:

it is administered by the Department of Mines and Minerals, which deals with non-renewable resources, although the reclamation is intended for renewable resources; it does not apply to all lands; there is little control over the action of mine operators.

#### Environment Conservation Authority Position Paper

The brief offered some comments on the position paper. The staff are in agreement with all subsections not mentioned.

#### Philosophy of Proposed Surface Reclamation.

- 2.2 Any development should be pre-planned to minimize the detrimental effects on the environment.
- 2.3 Development should include studies on environmental capacity and alternate "development".
- 2.4 Emphasis must be placed on the prevention of damage through pre-planning and strict environmental control
- 2.5 Legislation should contain segments on lease and development agreements which would compel resource developers to utilize proper development and reclamation methods.
- 2.7 It is firmly believed that there should be established a Surface Reclamation Board composed of members from all governmental departments, sub-departments and agencies which have an interest in the preservation of the environment and the economic development of Alberta; it should be an agency of the Department of the Environment.

#### Conceptual Framework

- 3.2 Surface disturbance legislation should be equally applicable to all lands within the Province.

#### Principles Included in the Proposed Legislation

- 4.06 Development proposals need to be reviewed prior to these three development periods.
- 4.07 Reclamation of disturbed lands must proceed simultaneously with operations; this requirement should be so legislated.
- 4.08 There should be legislation for the control of the method of reclamation from pre-planning to final stage.

4.09 These guidelines are necessary, but the legislation should include a clause which would allow for a higher standard where seen fit.

DR. TROST

Would you list some of the factors that are important and should be looked at in the sub-regional plan.

MR. CUNDY

We should be looking not only at the industrial potential but at human and natural resources, road networks and recreation potential. We are hoping that through the Authority, you will be able to encourage the Provincial Government to look at the need for sub-regional work and sub-regional plans.

DR. TROST

Do you anticipate problems of resource development impinging in a harmful way in the watershed areas that are to the west?

MR. CUNDY

There are two or three areas where dams are suggested, one around Rocky, one around the Bighorn and there is the Cartier Dam by Sundre. Without total planning or without total examination of the area, it could be very concerning.

DR. TROST

In any reclamation program the land is returned to an ultimate user. How should the ultimate user be brought into the pre-planning and the planning process?

MR. SHAW

I think that the local municipalities should be involved. In all probable cases the land could be, or should be, reclaimed to a standard sufficient for farming, therefore the Surface Reclamation Council and the development company should be in contact with the local municipalities.

MR. BABEY

In your earlier remarks you mentioned that about 50 acres per year was being lost to agricultural production. Is that lost during the time that it is being mined and reclaimed?

MR. SHAW

This is correct but the experimentation period in the area that I have



studied has accrued within the last ten years. My own opinion is that to date the land is not utilizable for other means, therefore it has been lost. The mining company does intend to further reclaim the land.

RESEARCH COUNCIL OF ALBERTA (GEOLOGY DIVISION)

DR. G.B. MELLON

EDMONTON

Introduction

At present about 25 to 50 billion tons of coal can be recovered by conventional underground or surface mining techniques in Alberta. The extraction and utilization of this resource should be undertaken with due regard for the material requirements, people and protection of the environment.

Distribution

Potential coal bearing formations underlie much of the southwestern Alberta plains and extend over a wide range of climatic and vegetative zones. About 13,250 square miles of this plains area is classed as moderate to high in coal potential, however, the area that may be surface mined is probably closer to 1,000 square miles.

In contrast to the plains the potential coal bearing strata in the foothills are complexly folded and faulted which makes exploration and extraction more difficult. Most of the coal in the western foothills is of a medium to low volatile bituminous type (coking coal), whereas, that in the eastern fringes is generally a high volatile bituminous type. It has been estimated that at least 50 square miles could be strip mined for coal in the foothills region in the next 20 years. This estimate does not include areas altered by access roads, plant sites, town sites and various service facilities.

Because of the diversity of physical conditions it is suggested that broad regulations be established for strip mining which would be flexible enough to meet the requirements of specific operations.

Reclamation

It is contended that strip mined reclamation should be based on

alternative land uses (recreation, game management, agriculture) rather than the restoration of the site to its original state. In many cases the increased assessibility provided by the mining activity makes alternative land uses a more logical approach.

It is recommended that a comprehensive physical and developmental survey of the proposed mine site and associated facilities be undertaken. Based on the survey results, recommendations would be made to minimize or eliminate environmental damage during all phases of the mining operations. All data available on disturbed and reclaimed terrain should be fully documented and made available to those involved in future reclamation projects.

#### Environmental Control

Recommendations pertaining to reclamation procedures should ensure that disturbed areas are adequately covered with top soil wherever possible. The preliminary surveys should assess the availability of surficial deposits and later recommendations should ensure that disturbed areas are adequately covered with top soil wherever possible.

The problem resulting from instability of waste embankments should be recognized and research in this area should be considered.

If a company has been granted a coal lease by the Government it should be allowed to assess its economic potential within the standards generally accepted by geologists and mining engineers. However, companies may be held responsible for reclamation procedures or compensation for lands disturbed by exploration activities. If a lease is withdrawn the company should be compensated by the Government.

There is no evidence to indicate any adverse effects of surface mining operations on the quality or quantity of ground water. Furthermore, pollution of surface waters from strip mining effluents is unlikely to be a problem in Western Canada since chemcials are not used in these operations and the sulphur content of foothills coal is generally low. Other problems caused by exploration or mining activities in the vicinity of water courses can best be prevented by excluding lands within a certain distance of these water courses at the planning stage.

#### Investigation Requirements

It is suggested that research be undertaken by a provincially

sponsored task force in the general areas of cost benefit analysis of coal surface mining, the effects on alternate land uses and technical aspects of mining and reclamation. The lack of knowledge on these matters, particularly in relation to the Alberta scene, underlines the necessity for such a study.

DR. TROST

Are you suggesting that regulations not be too strict or closely defined because the terrain and location problems are so diverse?

DR. MELLON

That is correct. We feel that the problems of operating and reclaiming mine areas in the prairies of south eastern Alberta are substantially different from those surface mine areas near tree line elevations in the foothills.

DR. TROST

I was interested in your comments on the watershed problems. It seemed to me that you said there hadn't been noticeable deleterious effects in this respect so far.

DR. MELLON

I will try to distinguish between problems associated with surface waters, streams, creeks and rivers. These are, I think, erosional problems and I think they exist locally in coal mining areas. It is our impression that much of the alarm that has been raised about subsurface, not surface, hydrology with respect to coal mining is not documented by scientific evidence. Our group at the Research Council of Alberta feels that there is really no place for suggesting that the groundwater supply of the prairies is going to be significantly affected by coal mining operations. This problem of subsurface hydrology is very complex and it would take a great deal of time to really go into it in detail.

DR. SMITH

I think you clearly indicated that land use, or alternate land uses, might be considered. Would you agree that land should be returned to where its economic value is as great or greater than before the mining took place?

DR. MELLON

I suppose this is the idea for which we would strive. The problem is putting a value on the aesthetic aspects of the land, particularly in the foothills. I think that there are very obvious difficulties in approaching this problem.





# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA

SUBMISSIONS FROM  
INDUSTRY and COMMERCIAL CONCERNS

ENVIRONMENT CONSERVATION  
AUTHORITY



COLEMAN COLLIERIES LIMITED

MR. E. D. JAMIESON

LETHBRIDGE

Coleman Collieries Limited is in the fuel production field and is interested in increasing the use of coal in Canadian markets, as well as in the efficient long term exploitation and the conservation of natural resources in south western Alberta. Since Coleman Collieries is the principal employer in the south western region, it is very important that the company's activities continue and that an economic burden imposed by exaggerated ecological enthusiasm should not be allowed to cripple the operation. The company takes a very serious view of its responsibilities regarding environmental control of its current operations, and reclamation of the effects of past mining activities in the Coleman area.

Most of the company's production comes from underground mining while strip mining will always remain of secondary importance.

In principle, Coleman Collieries is in agreement with the need for legislation on conservation of the environment to determine responsibilities and to lay down guidelines for surface mining operations. It is agreed that comprehensive environmental planning is necessary and that such plans should be presented by the operator to the appropriate government body before the operation commences. If the plan agreed to jointly by the operator and the government shows that the project is not economically feasible, it must be realized that this may result in unemployment or curtailment of operations. Compensation for environmental damage is an extremely vague concept. Each case would have to be decided on its merits and so specific regulations cannot be drawn up to cover all factors.

Because specific responsibilities are delegated to government departments it is therefore unnecessary for public hearings to be held on plans for development, which could be decided between the operator and the government departments concerned.

It is strongly felt that one single set of regulations cannot apply to all geographical areas of the province, as mining conditions

vary tremendously between the plains and the mountains. Coleman Collieries Limited feels that if all regulations apply equally to public and to patented lands, there are foreseeable difficulties, particularly with respect to permission to carry out inspections and in the application of penalties for violation of the regulations. The company position with respect to retroactive application of responsibility for reclamation is that Coleman Collieries Limited has a very good record. Refuse piles are being contoured and seeded successfully, mine effluent treatment has been established, old buildings have been demolished, roads have been paved and old settling ponds have been filled in and grassed.

Coleman Collieries considers that the strongest representations must be made against inclusion of a "financial security deposit" in the new legislation. The measure is unjustifiable as a deterrent to ensure the good behaviour of a long established company and unjust in legislation which contemplates severe penalties for violators of the regulations.

Coleman Collieries agrees that conservation of the environment is important and that legislation to define procedures and responsibilities is necessary. The comprehensive conservation plan is the most important single factor in the successful integration of mining operations and minimization of damage to the environment. This plan must be presented by the company and approved by the government, who must accept their share of responsibility for it, before operations commence.

DR. TROST

You indicated that it would be practical to distinguish between the plains, the foothills and the mountains when devising regulations for strip mining. Do you think they have elements in common that would enable some common approach?

MR. JAMIESON

I think they should be kept separate, because there is a lot of misconception. Reference to Kentucky and Illinois and places like that have no bearing on conditions which are encountered in the

mountains. The Tent Mountain area, which has been operating since 1946 is producing in the order of one-quarter million tons per annum, and this is our biggest strippable area. We have clinal conditions and under-ridges, which means overburden is maximum, with steeply pitching seams, twenty-five degrees to forty degrees or even more. Where coal stripping is done on relatively horizontal seams, as on the plains, reclamation or conservation is not at all similar.

DR. TROST

Can you tell us how your problems from underground mining compare with those from strip mining, from an environmental impact point of view?

MR. JAMIESON

The environmental impact from underground mining is much less than from strip mining. Our main problem in strip mining as far as environmental damage is concerned is the altitude. We are operating at between six and seven thousand feet elevation. One of our strip mines is on a westward facing slope, with a seam pitch at approximately twenty-five degrees, which is roughly the pitch of the slope, which means that this is more or less a continuous strip on a hillside. This was a natural talus slope and since reclamation is being insisted on it will bring it back to more than what it was. We have put forest strips on to it. This is one of our biggest strip mines where we have small pockets. I don't see us ever getting out more than thirty percent of the coal. We are improving the mechanization of our underground mining so that productivity is beginning to approach that of our strip mining. The main reason for having seventy percent underground coal is the quality which we must have to maintain the quality of our final product.

DR. TROST

Do you want to elaborate as to what reclamation standards are required of you now?

MR. JAMIESON

When we apply for exploration permits, we come under the jurisdiction of the Alberta Forest Service. Before our application can be approved, we must visit the site with one of the foresters, where at that time on the ground, we discuss what reclamation will be needed, how we will



put in culverts, where the roads should or should not go, and what reclamation procedure will be required in the case of roads and drill sites.

DR. TROST

Generally, what time elapses in your operations, between opening a pit and closing in a reclaimed state?

MR. JAMIESON

It depends on how far you go with the reclamation. If you say that it is contoured or leveled off and seeded, then I would say of the order of five to ten years.

DR. TROST

We very much appreciate the difficulties that the mine operators are put to and also eventually that the expertise needed for reclamation will have to be developed under their supervision.

MR. JAMIESON

Yes, I agree with that. I think the Department of Lands and Forests and the Alberta Forest Service can help tremendously. I honestly believe that they should be the supervisory force, as all our mines are located in the Crowsnest forests. As far as research goes, I know that the Research Council of Alberta is doing some work on environmental control and I think they are doing it for McIntyre Porcupine.

DR. TROST

You had made comments on the position paper, indicating that there were difficulties in deciding the magnitude of the compensation for environmental damage and that the responsibility for a certain aspect of the regulation should be borne jointly by government and by industry. It seems to me these are important points in your submission. Do you want to elaborate on them?

MR. JAMIESON

I think it is a vague field when people speak about environmental damage or recreational damage. The situation has to be faced as to whether operations carry on or alternately someone decides that a mountain is of particular value. Here, someone is going to have to define that certain mountains are of environmental importance and should not be touched. The consequences of that will have to be

looked into very carefully and anyone who is operating in that area will have to be made aware of what the effects will be on his future production, I mean twenty to thirty years hence.

DR. TROST

Yes, but your basic position in your presentation was that reasonable environmental management, if worked in a proper way, was desirable and practical. Is that right?

MR. JAMIESON

Yes. I want to add that what I'm stressing is that once the plan is agreed to then the government department has agreed to what the mining company should do. If the mining company then doesn't carry it out, it should be liable to penalty but not to lose a sum of money which it has laid down as much as ten years previously (and this is where I really attack the performance bond).

MR. BABEY

Mr. Jamieson, recently I've noted in the press some statements indicating some unhappiness on the part of the Japanese; how would you describe the potential market for coal in Japan?

MR. JAMIESON

If we go into potential markets, I would say that potential markets are extremely encouraging. We have firm commitments to Japan for the next ten years, but added to this, and much more important, is that we are looking at markets elsewhere. We are encouraged because Western Canadian coal is excellent coking coal, one of the best coking coals in the world.

MR. BABEY

In your stripping operations at Coleman, what is the elevation of the mine?

MR. JAMIESON

At Tent Mountain the No. Four North is 5,900 to 6,100 feet. Next year we will be going up to what was the No. Two pit at 7,000 feet elevation. The Racehorse Creek strip is between 6,400 and 6,600 at this moment but was started off at 7,000 feet and has worked its way down the hillside.

MR. BABEY

In your experience, have you had any difficulties in regenerating growth at this level?

MR. JAMIESON

Yes, there is difficulty in regenerating growth. Over 6,500 feet in elevation, growth of any description is difficult. We cannot guarantee that we will produce a forest of spruce at that elevation, and I think that our conservation will be more in reshaping the rock that we have excavated into reasonable configuration of what the mountain ridges were. We will reseed but it will take it a long, long time for trees to grow.

DR. SMITH

You expressed concern that the companies might be faced with an economic burden that would be intolerable because of exaggerated claims for environmental impact. Do you have any specific examples of these exaggerated claims?

MR. JAMIESON

No. I am just pointing out the danger. It could be that the weight of opinion from public hearings might come from very enthusiastic environmental conservationists and this might outweigh my feelings in the matter.

LUSCAR LIMITED

MR. GEORGE COATES

EDMONTON

COAL MINING IN THE ALBERTA ECONOMY

The brief suggests that the total impact of the mining industry on the economy of Alberta is not fully recognized. Cost benefit analysis must give consideration to the fact that Alberta coal companies provide employment without government assistance as compared to the subsidized operations in Eastern Canada. Undue inhibition of the industry amounts to a cost to the economy of the province.

## MARKET SITUATION

Alberta coal producers face a very competitive market situation which is not fully appreciated outside of the industry. Most of Alberta's coal is thermal coal which is limited to Western Canada markets because of economic restraints. Japan has been the only major breakthrough with regard to foreign markets. The coal industry in Australia and the United States is very competitive with Alberta operations. Measures which increase the cost of mining coal in the province would have the effect of decreasing the market potential and could restrict the growth of the industry.

## COMMENTS ON PROPOSED LEGISLATION

There is no need to provide for expropriation measures. If the industry can run an economically viable operation and meet environmental protection standards then it should be permitted to do so. If the standards cannot be met, the industry will not proceed.

The exchange of mineral rights between government and industry is not a practical proposal because of the difficulty in equating deposits in terms of economically recoverable reserves. The company also objects to the suggestion that the Provincial Government may acquire control of Federal Government leases issued prior to 1930.

The brief urges that ministerial decisions to prohibit surface mining on the basis of cultural, scenic or aesthetic grounds should not be incorporated into the forthcoming legislation. Consultation between industry and government should occur as regulations are being formulated and there should be a right of appeal with regard to these regulations. Present legislation is fragmented to the point of confusion and should be consolidated to provide for a more efficient administration and operation for both industry and government.

The Company submits that the owner of the land should select an end use for the land (subject to later approval by a government agency) before mining operations begin and undertake reclamation procedures compatible with this end use. It is impractical to establish an end use earlier in the operation, such as before the issuance of the lease or prior to the exploration phase. The brief contends that reclamation



procedures cannot follow immediately after strip mining operation; a working space is necessary, as for example, at least three spoil pile ridges for stripping in the plains region.

Presently operating companies with a long history of mining activity in the Province should not be called upon to apply retroactively the reclamation standards of today to their operations prior to 1963. This would put them at a competitive disadvantage with newer mining firms.

The brief suggests that the concept of the mine operator bearing the total financial cost of reclamation should be carefully reconsidered.

#### SURFACE MINING

##### [a] Plains -

Forestburg Collieries Limited mine currently produces about 700,000 tons of coal per year which involves moving the overburden from 70 to 80 acres. The total area disturbed since 1949 is about 1.7 square miles. The brief summarizes that reclamation which has been undertaken at the Forestburg Mine which includes details on contouring, seeding, tree planting and the construction of an air strip. The leasing of 676 acres of reclaimed land for grazing purposes is cited as ample evidence of the effectiveness of the program.

##### [b] Mountains -

The Cardinal River Coals mine at Luscar was originally developed in 1921 as an underground operation. It was re-opened as a pit mine in 1968 and shipments of coal to Japan began in 1970. Based on their experience with the Cardinal River mine the company suggests that reclamation planning for mining operations in the mountains should deal specifically with standards for final contouring and the establishment of acceptable vegetative cover. It is also noted that the interception of water courses by surface mines is a serious problem for which regulations must be developed.

## EXPLORATION

In the foothills and mountain regions exploration for coal involves aerial or ground reconnaissance, testing with electronic equipment, a drilling program and finally bulk samples from open test pits. The brief outlines the present government regulations which apply to exploration activities and contends that tighter control or enforcement is not necessary.

### DR. TROST

It has been particularly helpful to have your submission since your company has experience in the three major areas in which coal is mined in the Province, the prairies, the foothills and mountains. On the basis of this experience, do you feel it would be an advantage if legislation and regulations were drawn up separately for these three areas?

### MR. COATES

I wouldn't care to say about the legislation, legislation is usually so broad. Certainly the regulations have to be entirely different for each of the three zones. In the mountains, for example, our knowledge of the revegetation process is simply too scanty at this time to know with any real certainty what the requirements should be. We are cooperating in research. This fall we have done our first large-scale planting of some 50 acres using flower seeds, grass seeds and tree seeds. Industry, government and science have to feel their way in that particular area.

### DR. TROST

The value of the coal in dollars per ton increases from the plains to the mountains and it may be that the reclamation costs are also different in the three areas. Could you say something about that?

### MR. COATES

Yes. It seems to me that in the mountains in particular, reclamation is not so much a separate operation as an intricate part of the planning and the conducting of a mining operation. This is why we feel there are two phases to the planning: first, to plan the final contour and make sure that mining operations are conducted in such a way as to achieve that final contour without needless and costly alterations. It is most

important to know that final contour before starting. Secondly, to plan revegetation is a separate operation.

Again the nature of the operations are so different. In the mountains we are opening up a vast pit, removing the coal, then back-filling that pit to its original contour and moving on to the next pit using the overburden from a second pit to back-fill the first pit and carrying this process on sequentially. Mining in the plains is a continual process. We are using a large shovel which could be a drag line picking up the overburden and putting it into the trench cut by the last pass.

DR. TROST

There has been so much talk about cost benefit analysis and its advantages, but that is a practical approach only if you analyze the sources of these costs and make judgments on that basis. I have been trying to find out if it is possible to analyze these costs and estimate their magnitude.

MR. COATES

Yes, I would say it is possible to analyze the cost of reclamation in particular, provided the standard is defined. I think you have probably seen Enders' report where he had done a very interesting survey of the costs of reclamation. He takes these costs up a few hundred dollars an acre to \$6,000 an acre depending on the end use of the property that was established.

DR. TROST

The way you talk about a reasonable time interval, which will vary in the three terrains no doubt, can you tell us what this might be?

MR. COATES

Here we definately have to distinguish between the mountains and the plains. On the plains it is more practical to think in terms of the function of distance. We can't operate on the spoil pile that has been created. There is a two phase reclamation operation; we move in and take the top off the spoil pile, we do not come to a completely flat contour. Then we have to plant. The seasonal factors come into this of course. With several feet of frost it is prohibitively expensive. We can only seed in the appropriate season. We would suggest a useful

rule might be that the operator might be allowed to leave three spoil piles behind the area in which he is operating.

DR. TROST

You mention that the economic benefits in Alberta, presumably from the operations of the coal industry, are greater than generally supposed.

MR. COATES

I think that we must take into account not only direct employment at the mine but we must also remember indirect employment; suppliers of materials and services. I am sure the Town of Hinton, for example, has had a tremendous economic stimulus from our operations. Our people are housed there. They use the local services. We are operating two unit trains in a continual shuffle service between our mine and deep water in Vancouver. We have become about the largest user of C.N. services in Western Canada; a very important source of revenue to the railway and all that goes with it. The bulk terminal operation is outside of Alberta but this certainly comes into it. We have invested many millions of dollars in equipment, construction of mine facilities, highways and railways into the area. We use large quantities of power. We pay taxes to the municipal and provincial authorities. We pay lease rentals and royalties to the provincial government and to individuals, indeed to some of the beneficiaries of the original prospectus in that mountain area. The industry and our company sponsors research and development projects. The list could be expanded. I think this will illustrate that there is a lot more to it than simply direct employment or royalties.

MR. BABEY

Mr. Coates, I gathered from your remarks that you felt that comprehensive environmental planning prior to issuing the permit or the lease was not practical. Could you suggest other methods, particularly in an area that has some potentially valuable coal, and where reclamation and revegetation might create quite a problem?

MR. COATES

The first problem is to establish that there is indeed an economic or recoverable deposit. Until we do that we are tilting at windmills. I would say that in the exploration stage, the need is to have regulations which minimize environmental disturbance in the course of exploration.



I submit that we are already regulated to the point where we have to do a 100% clean-up of slash and cut-lines. We have to reseed and fertilize lines cut out from the wilderness. So the mechanics are there for minimizing surface disturbance during the course of the exploration operation. We have to find out what is there. Is it economic? What is a likely scale of operation? This is quite a bearing on this comprehensive environmental planning in which we are speaking. Let's find out about the deposit and then, as a condition of commencing mining operations, let us do the comprehensive job as you are referring to.

DR. TROST

We have had many submissions about the undesirability of surface disturbances immediately juxtaposed to Kakwa Falls in the Grande Prairie area, or the National Parks, or other places of great beauty. Would you care to elaborate on the reasons for your opposition to restrictions to surface mining in locations of that sort?

MR. COATES

I think the underlying suggestion that the government would have to resort to expropriation is an assumption that the industry would not or could not reclaim land satisfactorily. This is, in our view, an erroneous assumption. It is a question of establishing the standards. Conceivably we have a technology to meet the standard. Whether we can do so economically is another matter. I am saying, that there be set standards, let them be varying, in an area of high recreational potential and particularly high standard, but if that standard can be met the industry should be allowed to proceed.

DR. SMITH

Mr. Coates, you have emphasized economic aspects throughout your brief. Would you then say that the environment protection cost should be passed on to the Japanese consumers if the coal is being exported?

MR. COATES

Perhaps, in the first place I think we would all acknowledge that, to the extent that the reclamation standards have tightened up, more cost would be involved and something has to become of that cost. I submit they are just three consequences of increased costs through reclamation. In the first place as with any cost increase, a producer (our industry

or any other industry) is going to endeavour to pass that cost increase on to his customer, to the extent that it is feasible for him to do so and still remain economic. Therein lies the rub. The second possibility: much of our coal and the coal produced by industry is sold on a long-term contract for the protection of both buyer and seller. Sometimes these contracts provide for certain cost increases or a portion of them to be passed on to the customer on a pre-arranged formula. Very often they do not allow for all cost increases to be passed on. To the extent that this is true, the producer is faced with a fifteen year commitment to supply coal and increased costs which he has had to absorb. The third effect of increased costs is that it detracts from the marketability of our coals. Returning to the extremely competitive situation that our coals face, we thus make our coal less competitive and put off the day when we can hopefully break into additional markets. One of those three consequences will result from increased reclamation costs.

DR. SMITH

Has Luscar and Cardinal River Company Limited anticipated fixed costs in reclamation? Did you allow for this over a fifteen year period in originally opening the property at Luscar?

MR. COATES

As prudent people we have allowed for costs we could foresee. It is very difficult to allow for costs you can't foresee and this is really one of our major concerns. We are committed to a long-term contract and you would be surprised how a seemingly innocuous regulation can have very drastic cost consequences for us. In a slope in an overburden dump, if that slope was flattened out, we must carry that material that much farther which means additional costs and more equipment because we are not geared up to do that particular operation.

McINTYRE COAL MINES LIMITED

MR. T. L. BEDARD

EDMONTON

Introduction -

McIntyre Porcupine Mines Limited have held mineral leases in the Smoky River area of Alberta since the early 1920's. At the present time the company is operating two underground and one open pit coal mine in the area producing a total of 2 million long tons of clean coal per year.

Environmental Work Being Done

The company has set up procedures to clear all proposed plans and obtain complete approval before proceeding with any mining or exploration. Field inspections are carried out in a cooperative manner and monthly meetings are held between the company and the Department of Lands and Forests, the Department of the Environment, the Department of Mines and Minerals and any other interested government agency. Within these meetings, future plans, current progress and expected and encountered problems are discussed. Cooperative programs have been established to monitor the quality of the water in the Smoky River; to study the effect of various seeding and fertilizers on exploration areas and the company has funded a project conducted by the Research Council of Alberta in the general areas of ground water, surface and drainage water, revegetation and slope stability.

Comments on the Position Statement

[a] The company agrees with the philosophy that the resource user has the responsibility of identifying potential problems and taking necessary corrective action. However, it must not be forgotten that unexpected unknowns can occur and it is imperative that legislation allow the industry flexibility in their actions.

[b] The mining industry does not accept the position that the use of a resource allocation is subject to termination as environmental matters may determine. Mineral exploration and development of mines

are very expensive and risky ventures; the possibility of a mineral lease being terminated would substantially increase the risk factor. Cooperation in problem solving is a better alternative to lease termination.

[c] It is not necessary to hold public hearings prior to the granting of exploration of mining rights. Public hearings are expensive and will detract from the time available for the competent regulatory agents to do their work.

[d] In some cases it may not be possible for reclamation to proceed simultaneously with operations. The intervening time will vary with the individual operations and the Authority must be left with the regulatory agents to define, in cooperation with the operator, a realistic reclamation schedule.

[e] It is necessary to have basic guidelines on plans for exploration, development and reclamation in order to let the regulatory agents and the operator know what is to be accomplished. However, it is strongly recommended that industry be given the opportunity to express their opinions and experiences on the draft versions of regulations before they become law.

The company recommends the establishment of a central source of information on the results of reclamation and preventative work done in the western provinces. If made available to operators this information could help eliminate duplication of efforts and errors.

DR. TROST

You made reference to the monitoring of water quality that is being done by McIntyre and it might be interesting to the audience and to ourselves if you were to elaborate on that.

MR. BEDARD

We are testing for siltation load caused by ourselves, pH, iron content and generally all major factors that are in the water in the river. We have been taking samples above the mine site and below the mine site.

DR. TROST

You made some statements in your brief resisting your proposition that mineral leases could be cancelled, under any circumstances. In your view, then, would a stop-order authority be a preferable way for the public to be protected against bad use rather than cancellation of the mineral lease?



MR. BEDARD

I assume by that you mean stop mining until you solve your problems. I feel that it would be more acceptable but I would not say that I would accept it in total.

DR. TROST

Do you think the Government should have any control?

MR. BEDARD

I feel there should be some control but within reason.

DR. TROST

In resisting public hearings, you use the costs of public hearings as your principle reason for opposing them. Does the company bear the cost of public hearings?

MR. BEDARD

We are bearing the cost of my time here. They are bearing the cost of the preparation of the brief, and by the number of industry briefs in here, I think there has been a lot of money spent on this.

DR. TROST

Is it cost that mitigates against the benefits of public hearings?

MR. BEDARD

Yes. I think more important is the time involved. I think it would be better spent on trying to solve the problems. I see several of the people from regulatory agencies who have been helping us and from the Research Council. I think this time would be better spent on the problems that we are having.

DR. TROST

It is the cost of your effort and time that makes you oppose them; there is no other reason ancillary to that?

MR. BEDARD

No.

DR. SMITH

In the very early part of your brief, in reference to public hearings, you use the alternate method of the regulatory agencies that have the operators exploring the problems and suggesting solutions. Do you not think that the public should have some input or some stake in their own resources in making a decision?

MR. BEDARD

I feel that the public would be intimately involved because of the regulatory agencies. I know in our dealings with them they do consider what other people would be thinking and what other people would be using. I have also recommended in this that if they felt fit, they would contact an individual group for their opinion.

DR. SMITH

Do you think that our resources can be safely entrusted to the government and industry without directly involving public?

MR. BEDARD

Yes, I feel so.

THE STERLING COAL VALLEY MINING COMPANY

MR. CURTIS ROBERTS

EDMONTON

The Company's mine has now operated since 1955. But with the re-emergence of coal as a vital industry the development of environmental regulations with regard to strip mining could effect the Company's future.

The proposal for strip mining legislation in Alberta is indicative of a growing public awareness of general environmental problems which mankind must solve in the future if he is to survive.

Due to geographical and transportation restraints, strip mining provides the one main competitive advantage for Alberta coal producers in world markets. In strip mining the output per man is 100% higher, overall recovery is 60% higher and operating costs are 25-30% less than underground mining. For these reasons the future of the coal industry in Alberta depends on the future of strip mining.

The scope of environmental problems which may arise as a result of strip mining is recognized by the coal industry. Firm and fair reclamation laws are not only necessary but may serve to coordinate government and industry's efforts, time and money to solve these problems. However, the following facts should be borne in mind when drafting the legislation:

1. The economic burden and responsibility of the many facets involved; development of required technology, determination of the best potential land use and the final conversion to its reclaimed state cannot be borne solely by the coal operator involved without causing him to become economically non-competitive.
2. It may be unrealistic to place punitive and over-restrictive controls on the coal industry which is likely to provide the major energy source in the Province.
3. Any legislation enacted must be flexible enough to meet the unique requirements of the individual coal operations in the province.
4. A workable definition of "environmental quality" has to be established and priorities and land usage must be considered and organized. Attempting to reconstruct the land "as it was" is not always a practical proposal. More emphasis should be placed on possibly by-products associated with reclamation such as, for example, a prolific growth of huckleberries which has occurred on the Company's land which was strip mined in the early 1900's.

The economic, social and environmental problems posed by large scale strip mining underlie the necessity for comprehensive, regional planning. In this regard the following proposals and recommendations are presented:

1. A complete ecological inventory (soils, water resources, vegetation, wildlife, topography) should be conducted for each proposed mine site.
2. Based on the results of the inventory, environmental experts could consider alternate land uses, reclamation procedures and possible environmental enhancement.
3. A more comprehensive systems analysis of the resources of a region should be prepared. This would allow government agencies to evaluate the inter-relationships between various resources and the probable consequences to the environment of alternate land uses.

4. Participants in this regional planning process should include both the Alberta Government and its University system, agencies of the Federal Government, and the industrial and coal organizations.

DR. TROST

Your paper suggested that the costs of reclamation might be sufficiently extensive that the coal operator shouldn't bear them himself.

MR. ROBERTS

Yes. What we are suggesting is that the initial status: exploration into an area, regional planning, etc., should be carried out by the government. Obviously the reclamation would have to be borne by the companies involved, but the purpose is to offset these costs in some manner. My example was huckleberry farming. If imaginative people could figure out other methods of making their individual mining sites compatible with the environment and offset these costs with some sort of by-product, then that would be the most advantageous method.

MR. BABEY

I was interested in your remark about the ecological inventory for each mine site. Is the data that would be most essential for this type of inventory available? Is it a matter of collating it, or is it a question of such needed research being done to provide some of the things that might be unknown?

MR. ROBERTS

I think that this data is available. I think the specifics, for instance, if you are talking about foothills area there is a certain amount of data involved, if you are talking about an individual mine within that framework, then you would have to do a certain amount of research to find specific facts in this particular area. In that capacity there is a lot of research work to be done.

MR. BABEY

Would the ecological inventory be used in developing the mining operation and the reclamation program?

MR. ROBERTS

Right. It would determine what aspects of the environment that were



being upset or would be upset by induced changes of strip mining.

DR. SMITH

Would you care to comment on the feasibility of a company with all its associated expertise in soils, engineering, mining, geology and so on, having a total involvement in research. Rather than having governments or universities carry it out, the mining companies should be involved. I think they would believe it more if they were involved.

MR. ROBERTS

I think this is necessary. The only difference is that it imposes an economic burden on the company and this has to be reflected in their cost. I think the government has more access to the experts that are necessary through the university system. As we said, these are the people that would be more qualified to govern and more impartial in making a decision in this matter.

ALBERTA COAL LIMITED

MR. A. F. COLLINS

CALGARY

#### The Nature, Extent and Significance of Surface Mining

When compared with underground methods surface mining offers distinct advantages. It makes possible the recovery of deposits which for physical reasons cannot be mined underground; provides safer working conditions; usually results in the complete recovery of the deposit; and, most significantly, it is generally cheaper in terms of cost per unit of production. Surface mining is not applicable to all situations. The ratio between the thickness of the overburden and the underlying coal deposits is the primary factor that determines whether a particular mining venture can survive in a competitive market.

The procedure for surface mining usually consists of prospecting or exploration and the actual mining or recovery phase. Exploration techniques generally employed consist of either drilling or excavating shallow trenches or pits. Surface mining methods employed to recover

minerals and fuels are generally classified as (1) open pit mining, (2) strip mining, (3) auger mining and (4) hydraulic mining. The report presents a brief description of the techniques involved and the materials usually extracted by each method.

Regardless of the equipment used, the surface mining cycle usually consists of five steps:

1. Site preparation, clearing vegetation and other obstructions and constructing access roads and ancillary installations.
2. Removal and disposal of overburden.
3. Excavation and loading of ore.
4. Transportation of the ore to a concentrator, processing plant, storage area or directly to market.
5. Reclamation.

Experience has demonstrated that when reclamation of the land is integrated into both the pre-planning and operational stages, it can be done more effectively and at a lower cost than as a separate operation.

An estimated 8,000 acres of land, about thirteen square miles, have been disturbed by surface mining for coal in Alberta up to and including 1971. This does not include acreage affected by mine access roads, exploration activities, water impoundment, rubbish dumps and abandoned equipment. All of these add to the total land that must be considered as being adversely affected by surface mining.

The importance of surface mining to the coal industry is easily measured. In 1971 it accounted for about four fifths of the coal produced in Alberta and of this total about 80% is used directly as an energy source in the thermal production of electricity. Thus the relationship of coal to other industrial activities is quite clear.

### Environmental Impact

The brief divides the environmental consequences of surface mining activity into the following four categories:

1. Ecological effects.
2. Topographic effects, i.e. accidental or deliberately engineered modification of the surface or near surface structure and drainage system.

3. Pollution by airborne dusts and other debris.
4. Chemical pollution of air, soil or water.

In practice these effects will generally interact and on occasion such interaction may be very complex. However, for purposes of this brief it will be helpful to treat these environmental consequences as if they were substantially independent effects.

Although any general survey of environmental effects must necessarily deal in probabilities, with respect to the consequences of surface mining in the plains regions of Alberta we are able to draw a fairly firm conclusion. Provided that mining is followed by appropriate land reclamation, coal stripping operations will not significantly effect the topographical features of these areas. Nor is there any reason for anticipating significant ecological damage; in fact, reclamation will more often than not leave sites substantially better endowed than they were when mining began.

A more pertinent question is to what extent surface mining in the prairie areas of Alberta is likely to cause unacceptable environmental damage through pollution. To begin with most mining operations are well removed from urban areas in Alberta. Furthermore, as a general rule, a coal mine is only a source of chemical pollution to the extent that it improperly discharges acid mine waters (dilute sulphuric acid mixtures). However, Alberta prairie coals contain no more than 0.3% pyritic sulphur and pollution from these sources is therefore likely to be insignificant.

The same is true of possible air pollution from smokes and oxides of carbon generated by mine fires. The risk of fire is directly related to pyrite concentrations and on the Alberta prairies that risk will therefore be negligible even should the mine site remain open and inoperative for comparably long periods. There is somewhat greater danger from uncontrolled self initiated combustion in storage piles, in which ignition can be triggered by alternating partial drawing and wetting; but this danger is well understood and is easily eliminated by proper construction of the stock pile.

For all practical purposes the real problem area presented by pollution results from the discharge of solids into air or water.

However, visual observation at all of the currently operating surface mines in Alberta suggest that neither mining nor haulage creates appreciably more dust than ordinary traffic travelling over secondary roads. Also there is no evidence that surface mining adversely affects the volume, flow or quality of any of the water bodies that join these sites. In summary, it does not appear that surface mining in Alberta on the prairies constitutes any tangible threat to the environment, or that the public interest need concern itself with more than the question of what constitutes acceptable reclamation.

The problems associated with strip mining in the foothills are quite different. Public concern over pollution and increasing demands for recreation may result in industrial activities being barred from these regions all together. The brief contends that environmental damage through past mining in the foothills area of Alberta has been grossly exaggerated. It furthermore contends that while each mine may remove some surface cover and cause some displacement of wildlife, no surface mining venture is large enough to destroy any significant segment of a wild animal's domain. Real ecological damage is only likely to accrue from careless mining procedures which could result in landslides, excessive erosion and water pollution. Poorly planned site preparation could also make eventually surface reclamation difficult and costly. As in the plains region, mountain coals will not cause an actual chemical contamination of air or water, nor will the mine effluent. However mountain coals readily break up into fine particles which, if discharged into streams, may cause more or less severe silting.

Some of these problems may gain importance from the fact that all presently planned foothills mining operations will also involve cleaning, sizing and thermal drying of the coal. This introduction of additional material handling stages could conceivably increase silting and dust pollution. This applies with special force to the construction of washery refuse spoil banks. These could pose greater dangers of water pollution and they also prove troublesome through self ignition and sustain low combustion. The brief contends that all of these problems can be avoided through proper programming of surface mining operations.



There may be beneficial side effects from surface mining in the foothills areas. As a result of blasting certain desirable hydrologic effects may occur and the danger of floods may be diminished. Many mine access roads, when properly repaired and maintained, can provide accessibility for fire protection, recreation and forest management activities. Tourism can also be encouraged as several surface mining sites will be located in areas that afford spectacular views of mountains, valleys and lakes. Abandoned surface mines on the prairies may give rise to recreational areas. Water in the form of small ponds or lakes, and the spoil piles themselves, frequently provide a pleasant topographic change in areas of virtually flat land.

All large Alberta coal producers accept reclamation as an integral part of their overall mining operations and already have reclamation projects actively in hand. If there is any uncertainty at this time it relates mainly to how the reclaimed site ought to be contoured. For example, should the mines in the prairie areas be completely levelled or should an undulating terrain be created. The terrain in the foothills areas imposes definite restrictions on surface reclamation and at high elevations, where soil and plant cover is scanty, reclamation in the commonly accepted sense is clearly impossible. Even at less extreme heights considerable experimentation will undoubtedly be necessary in order to arrive at selection of appropriate seeds, seedlings, and seeding techniques. In many instances, reclamation will, as in the case of lumber operations, mean concern with post mining clean up and overall aesthetics rather than with actual site restoration.

These restrictions imply that statutory provisions covering mine reclamation in Alberta will have to be flexible if they are to be effective; a comprehensive uniform set of regulations is not likely to be meaningful. It should also be remembered that what the land produced before the surface mining commenced is a fairly good indicator of what it can produce after strip mining has been completed. If the land grew timber once it can grow timber again, however, if its principle crop was lichens before the rocks were turned over to reveal the coal, it may never produce anything but lichens.

### Perspective

Even after a grand total of over 60 years of operation at high production rates the total area of land disturbed by strip mining is comparatively small when compared with other forms of land use (highways, city expansion, water reservoirs). For example the city of Calgary has expanded into prime farming country. Air pollution has increased immeasurably from furnaces, fire places, sewage, garbage, etc. and effluents discharged both into the air and into the water create many forms of waste products disposal problems. Land covered by our cities is lost forever for production purposes, while this is not true of lands disturbed by strip mining. Furthermore, the estimated maximum total surface area which might ever be strip mined is eight-tenths of one percent of the total surface area of the province.

With regard to economics, it can be demonstrated that a sizable strip surface coal mine in Alberta can mine and recover coal in the order of 20,000 tons per acre. Using \$2.50 per ton as the total mining cost of that coal we can readily see that over \$50,000 worth of coal can be produced per acre. Even at 25 bushels per acre per year of wheat from the same acreage the earning power of each acre per year under conventional farming methods would take over 1,000 years of production in order to provide the same economic benefit.

In 1971 upwards of \$600,000 was paid to the Province of Alberta by mining companies in the form of royalties on coal mined on Crown owned land. Approximately 60% of this coal is used for the thermal generation of power in the province. The lower fuel cost to the power companies as a result of strip mined coal has a direct bearing on lower power cost to the consuming public. Perhaps more important, industry will go elsewhere if power costs are to be increased in any significant amount.

### Reclamation and Recommendations

The reclamation of land disturbed by surface mining is based on the elimination or abatement of undesirable conditions and the development of restored land and water resources to more productive uses.

"Basic reclamation" would include measures designed to alleviate or prevent erosion, acid discharge and other physical and chemical after effects of

surface mining that are generally associated with derelict lands. The rehabilitation of mined land for specific purposes would require more extensive treatment and the expenditure of additional funds. Such rehabilitation could involve the development of surface mine lands for specialized purposes and such land might serve more than one purpose or be developed for use other than its original use. Some examples are as follows:

- [a] Crop land. Land treatment required would include levelling, burying large rocks, incorporating fine material and organic matter in the top soil, providing for adequate water movement of the area and fertilization.
- [b] Pasture land. The land would have to be made smooth enough to permit the operation of farm equipment needed to plant and harvest forage crops.
- [c] Range land. In most areas of Alberta strike-off grading would be sufficient, however, development of water for livestock and for seeding might be required in some instances.
- [d] Wild life. In addition to erosion controls specific game food and cover plantings would be needed to improve wildlife habitat. Additional costs would be incurred by the provision of water hole and wetland development and the leasing of the land to ensure management and public use of the areas.
- [e] Recreation. Provision would have to be made for water supplies, sewage facilities, trails, boat launching sites, picnic areas and similar facilities.

Over the long term, the establishment of effective mining conservation and reclamation practices for future surface mining is more important than efforts to repair lands damaged in the past. Surface mining regulations must be framed so that land acreage disturbed annually does not ever exceed the amount reclaimed annually, thus making sure that the backlog of unreclaimed land does not increase. Industry should be held responsible for seeing that the gap between land disturbance and restoration grows no wider.

The amount that surface mining operators can afford to pay for reclamation varies widely among individual operations in this Province.

Each surface mining operation and locality has its own unique characteristics. Regulations dealing with reclamation activities therefore will undoubtedly be more effective if they are coached in terms of results and objectives and provide enforcement officials with the flexibility needed to apply the regulations equitably to individual operations in various localities. To implement such a program, Provincial standards and requirements should be developed for the reclamation and rehabilitation of surface mining areas. In cooperation with industry, conservation and other public groups, various levels of Government and other interested parties. Provincial agencies should impose effective coordinated controls upon all surface mining activities conducted within the confines of the Province.

In cooperation with the Federal Government, with Universities and with industry and conservation groups a thoroughly, coordinated research effort is required in the fields of mining techniques, spoil handling, soil classification, soil treatment, plant growth and survival rates, water quality, erosion control and land uses in mining areas. The Provincial Government should promote, sponsor and play an active role in research in these matters.

DR. TROST

In your view, under present technology, can strip mining in fact be economically done in such a way as to include reasonable reclamation effects.

MR. COLLINS

The "reasonable" to the operator and the person with the whole matter of reclamation is perspective is that the land be replaced and restored as close to its original state as possible. This is more readily possible on the prairies than in the mountains. Each individual area of two to three square miles in this province has its own problems of reclamation, growth, improvement and potential. We consider that each individual area should be given thorough study but not based on regulations which hamper or hinder the individuality of that area.

DR. TROST

Have you figures for the extra cost of reclamation per acre in a case



that is farm land and is to be restored to farm land again?

MR. COLLINS

I am prepared to give you order of magnitude figures which are taken out of our experience at several places in Alberta. The overall reclamation costs, depending on the type of terrain on which you are operating, can run from \$150.00 per acre, and that is basic reclamation, to an excess of \$1,000.00 per acre.

DR. TROST

Is it true that those figures, even though they do cover a wide range, represent a small percentage of the value of the coal itself and consequently of the price per ton of coal?

MR. COLLINS

The best example I can give you is one mine which is in Alberta. The reclamation costs are approximately 5¢ per ton which would be of the order of 4% of the total mine cost and would be in the order of between 20% and 25% of the mined profit. To the extent that those figures are accurate this is a minimal cost. Any cost of the order of 5¢ a ton over a product that is worth \$1.25 a ton when it is mined is not an insignificant percentage.

DR. TROST

Do you want to comment on the cost of reclamation as compared with what the land will be used for?

MR. COLLINS

At that particular mine the reclamation costs probably run in the area of \$200.00 an acre. For land in that particular area which is marginal farming, reasonably good pasture, somewhere in the area of \$200.00 an acre seems to us in the industry enough to spend putting that land back to that kind of use.

MR. BABEY

What is the time gap between the mining and the reclamation program that is to bring it to the development stage?

MR. COLLINS

A mining operation of a million tons a year, because of operational requirements the mine pits would probably be three to five years before levelling and contouring.

DR. SMITH

What do you personally think about the benefits of exported coal vs. coal that is used within Alberta in terms of provincial benefits?

MR. COLLINS

It has no bearing that the economic benefits to the Province are different and the economic parameters are different. The economic benefit to the province is substantial in either. The lights that we are using today are from coal being used by our company at an economic level which allows us to enjoy one of the lowest power rates in North America. There has been discussion about \$22.00 coal. No coal has been shipped out of Canada to my knowledge at any price F.O.B. higher than \$19.00. With the ship loading costs, stock piling costs at the port, the unloading from the freight train, the freight haul cost, and the loading cost into the freight cars at this end, the \$19.00 translates itself back to mining costs are probably between \$6.00 and \$8.00. The economic benefit to the Province starts at this point as the export coal has to be carefully processed, washed, handled and loaded, all of which are reasonably labor intensive and produce economic benefit.

CANMORE MINES LIMITED

MR. H. G. STEPHENSON

CALGARY

Canmore Mines Limited operates underground and surface mines in the upper Bow Valley and employs 250 people, mostly Canadians. The brief contends that the operation of the strip mines on Mount Rundle and the associate reclamation will not detract from the beauty of the landscape, but rather provide amenities which do not presently exist.

An oral and photographic description of strip mining activity at Canmore brought out the following points:

1. Mine excavations are being backfilled, contoured, seeded and mulched. Some of the plants established were attractive to birds and wild game.

2. The company plans to develop a lake on the reclaimed land with a sandy beach and surround it by trees and shrubs.
3. Experiments have been conducted in seeding and mulching reclaimed land. It was noted that fourteen different varieties of wild flowers had germinated naturally on these areas.
4. Mine access roads have been well maintained and oiled to prevent dust pollution.
5. Topsoil, gravel and broken rock are placed in three separate spoil piles which are later replaced in proper order in the excavation.
6. Timber cleared for strip mining is either used for underground mine props or donated as firewood for camp sites.
7. Water from the company's underground mines is equivalent to relatively good spring water and imposes no danger as a source of pollution. A system for removing solids, coal dust, silt, etc. from strip mine effluent has proven to be extremely effective. Part to this system involves a filtration pond which is more effective than a simple settling pond.
8. Less than 10% of the lower slopes on Mount Rundle will be effected by strip mining. The effected areas will grow up in grass and may be no more displeasing to the eye than the nearby highway.

At no time does the company expect the area being mined to exceed 60 acres and reclamation will be underway on an additional 30 acres at the same time. Reclamation and mining will progress simultaneously.

The following benefits will arise following completion of reclamation:

1. An area originally covered in dense timber will be made more attractive by a number of small grassy areas planted with trees and shrubs.
2. The grassy areas will provide valuable winter range for elk, deer and sheep.
3. Fire break and access roads will have been created in a high fire hazard area. If the timber on Mount Rundle burns the scenic value will be greatly diminished for many years.

4. The lakes and grassy areas will provide a beautiful recreation area.

The economic aspects of strip mining are summarized as follows:

1. The return to the province is much higher than 10¢ per ton royalties. The company has paid \$75,000 in lease rentals on Mount Rundle for a period when no coal was mined. Payrolls arising from the operation will be in excess of two and one-half million dollars this year.
2. Of the total population of Canmore (2,000 people) about 250 are employed full time by the company and an equal amount are employed in service industries which are dependent on the mine payroll.
3. At the present time Canmore Mines can only operate economically by a combination of underground and surface mining. Within five to ten years the stripping reserves will be exhausted and underground methods will have had to be substantially developed. The deposits on Mount Rundle are the company's only known source of coking coal needed for its contracts to Japan.
4. If strip mining is stopped, the company will be forced to close down and Canmore will become a ghost town. The area is already economically depressed and tourist and recreation cannot support the town.
5. Twenty years ago the company returned 1,000 acres at \$25.00 per acre to the Federal Government for inclusion in Banff National Park.

#### Comments on Proposed Legislation

Although the company sympathizes with the public's increasing awareness of reclamation, it contends that adequate rules and regulations are presently being enforced and when reclamation has been completed on company lands the area will be more beneficial than before the mining operation commenced.

The brief agrees that the public should be invited to attend public hearings on matters directly concerning their interest; however, if this philosophy was carried to extremes it would be difficult for a



company to efficiently manage its affairs. It is suggested that when a decision is made on a general resource development program, each phase or variation thereof should not require public debate.

The company submits that the right of expropriation outlined in the proposed legislation is a definite deterrent to the development of the coal industry in Alberta. The threat of such proceedings would prevent companies from pursuing long-term plans since they could have their interests abruptly taken away. The only reasonable type of legislation in this regard should provide for expropriation of interest in minerals and lands only if a company's operations fail to comply with the regulations as prescribed by the Government. The brief contends that reclamation of disturbed lands cannot always be carried out simultaneously with mining operations, and therefore legislation should not make this requirement. As an alternative, companies could be obliged to reclaim the land a certain number of days following the mining activities. Furthermore, legislation should enforce reclamation for all forms of surface development, not only strip mining.

It is recommended that security deposits be in a form which could earn interest for the depositor. Also, the brief urges that regulations and procedures prescribed for permission to mine should be set forth and administered by one department.

In conclusion, the time has come for greater understanding and cooperation between conservationists and the mining industry to solve their mutual problems.

#### DR. TROST

There is a great deal of difference in the techniques that are used to strip mine and then to reclaim. Would you elaborate on the management techniques that you use in any of these overall operations.

#### MR. STEPHENSON

From the very start we take into account the final result of strip mining and the reclamation procedures we have to develop. We submit our plan to the Government and go through the present procedures for opening up a strip mine. First we get permission for prospecting; then permission in principle from the Government to operate our mine and then we submit

detailed plans of the mine itself and the reclamation procedures that have to take place afterward. When approved we go ahead with the strip mine. We have a reclamation foreman who is employed on reclamation for six months, only because of the climate. The strip mine is surveyed once a week and an effort is made to place the material excavated in the best possible position for backfilling. We keep a record of our reclamation procedures which shows us at any one time the total area that we have disturbed, the area we have reclaimed, and the area remaining to be reclaimed.

DR. TROST

Are there sites that are strippable in the mountains in which the kind of reclamation that you have described can be done only with difficulty or risk?

MR. STEPHENSON

There are definitely sites which contain coal that could not be reclaimed satisfactorily and therefore will not be strip mined. There are sites where it will be a little more difficult and these we would consider for mining. There are also sites where in fact it is much easier.

DR. TROST

Would you mine areas which are strippable but in which reclamation is too difficult?

MR. STEPHENSON

There are two sites that I can think of where there is coal but which will not be strip mined, because we could not carry out the reclamation procedures.

DR. TROST

Is it your view that ultimately underground mining might re-emerge as a principle way of getting coal from the mountains?

MR. STEPHENSON

If there still is a coal industry in Alberta in ten years time, certainly the major proportion of the coal will be produced by underground methods because by then all or a large portion of the strip mined coal will have been worked out. Strip mining is a short-term experience which has to be adopted because of the low price on coal. Developing underground mines and techniques for the very difficult geological conditions that exist

in the Rocky Mountains would take a long time. We have an underground mine which is operating reasonably well in fairly good conditions but after we have worked out all the easy coal, we will have to tackle more difficult coal at 40° to 50°, at great depths over 2,000 feet, which we are not technically capable of tackling. Techniques will be developed over the next ten years so that the underground coal can become an economic reserve which would replace the strip mined coal.

DR. TROST

As technology changes sometimes what was impossible at one time becomes possible later on. May it be that later on a secondary recovery could be achieved from a surface mining approach? The other side of the question is, can surface mining techniques now effect the way in which underground mining can get the residual deposits?

MR. STEPHENSON

You could operate a strip mine at a ratio of 4 yards of overburden to 1 ton of coal and at the moment that may be the maximum you can work economically. You work the mine, reclaim it, backfill it, and then in 10 years time you might find that techniques have progressed so that you can work at higher ratios. The same coal however could be worked at higher ratios in underground development and in my opinion we are more likely to progress with improving techniques in underground mining. Having worked a strip mine along the outcrop of the seam, if that seam is continuous then there is nothing to stop us from leaving in a coal seam along the bottom edge of the strip mine for an underground mine on the dip side. I have done this in India without any danger to the men and it worked quite successfully. I am sure it could be done here.

DR. WALTER TROST

What is the time interval that you find in practice between opening a reasonably sized pit and finally reclaiming it?

MR. STEPHENSON

On one of our strip mines the time between opening that mine and seeding it was only five months. It was a very small strip mine and only produced 16,000 tons of coal. Another area took a year and one-half to work out the coal, about a year to backfill and about two months to seed with a total time period approaching 3 years. On Mount Rundle I would say three

years from starting the mining to getting the grass seed on would be a reasonable figure. It would take three to five years on a mine with reserves of two or three million tons as compared to our reserves of 150,000 tons.

MR. BABEY

You mentioned that the company is setting aside 30¢ a ton and about \$1750.00 per acre for reclamation, and that, in fact, up until now you were spending about 60% of this. Your actual cost of reclamation in that area is around 21¢ a ton or slightly over \$1,000.00 per acre. Is that right?

MR. STEPHENSON

Actually, 25¢ a ton is what we have had to spend so far on reclamation and we have set aside 35¢ on the next strip mine. Frankly, the reason we set aside more in this case is because of the steeper slopes on Mount Rundle. It will take more money to reclaim the Mount Rundle mine than any of the mines that we have operated so far. We are quite confident we can do it for 35¢.

THE COAL ASSOCIATION OF CANADA

MR. GEORGE BARNES

CALGARY

The Coal Association of Canada brief was submitted on behalf of its Alberta members and supported by the following companies:

Alberta Coal Limited

Canmore Mines Limited

Can Pac Minerals Limited

Cardinal River Coals Limited

Coleman Collieries Limited

Luscar Limited

McIntyre Coal Mines Limited

Scurry-Rainbow Oil Limited



The brief stated that the companies and individuals within the companies are in accord with government and public concern with regard to ecological balance and that hearings with regard to environmental impact are also desirable with respect to activity other than mining which may affect the environment. The brief stated the ecologists have rendered a valuable service to society by alerting it to dangers which were ahead if corrective actions were not taken. However the negative was frequently exaggerated and reference to successful reclamation projects eliminated. It was suggested that a balance should exist between the desire for completely undisturbed environment and the need for an energy dependent society and a high standard of living.

The brief indicated that of the approximately 48 billion tons of coal reserves, either proven or inferred, about one-half or 24 billion tons may be considered recoverable under existing mining techniques. It is estimated that 93% of Canada's total coal reserves can be developed only through underground mining methods.

The brief stated that there is currently a popular misconception that coal developments offer a highly profitable potential for developers, but that this is an illusion and the major revenue generated goes into the Province and country. However the emphasis on open cast mining potential at this point in time is a matter of economics. The lower cost of open pit mining allows the industry to respond to the energy demand of the country, to create new jobs, to generate new taxation revenue and to enhance the activity and development of service and secondary industries.

The brief recognized that coal operations in the past have left unsightly scars on the landscape and have given coal mining a bad image. The brief suggested that those companies now engaged in coal production have a real concern for environmental protection.

An estimate was made for operating and potential mines and the production which might be obtained from them between 1971 and 1978. Four mines (Coleman, Canmore, Cardinal, McIntyre) have a potential for about 5 million tons per year in total of coking coal over the next 15 years for a total of approximately 70 million tons. Potentially, there may be six more large mines producing a possible 12 million tons per annum of coking coal for export. These additional six mines might

be located north of Coleman, Highwood River area, Panther River area, Luscar area, north of Hinton and Grande Cache. Alberta Coal Company and Luscar Limited are major producers of thermal coal, which is expected to exceed 4.2 million tons in 1971 and could rise to more than 7.5 million tons per annum by 1975 or 1976. Most of the thermal coal is used by Calgary Power Limited and Canadian Utilities Limited. The brief noted that the cost of electric power in Alberta is one of the lowest in the world, and related this to the proximity of power generating plants to a source of low cost energy- coal. Any increase in the cost of the coal production would be directly reflected in an upward revision of industrial and individual householder electric power rates.

With respect to the economics of export of coking coal and of thermal coal mining operations, it was estimated that production would be approximately 10 million tons by 1972, creating a total of 2,500 jobs with a gross payroll of approximately 18 million dollars per annum, directly connected with mining and processing operations. It was estimated that there could be an additional 5,000 jobs which are indirectly independent on the industry in the areas of transportation, port loading, construction, supply and service industries, government employees etc.

The direct capital cost of bringing new coking coal mines into production is a minimum of \$25.00 per annual ton, or 25 million dollars for a one million ton per annum mine. Mines with production smaller than 1 million to 2 million tons per annum would not be economic. If all coking and thermal coal production potentials are realized by 1975 to 1978, production would be about 24.5 million tons per annum; 19.5 million tons open case and 5 million tons underground. This ratio will be reversed in the future if development of the resource is to continue. Total Alberta coal production will result in direct labor charges of 40 million dollars per annum with approximately 5,000 men employed, and a projected 10,000 jobs dependent on the industry. The brief emphasized that the coal industry and its development can be a significant contributing factor in relation to the resolution in Canada's unemployment problem.

The brief emphasized that with respect to coking coal for export there may be a total of 8 or 9 mines located at approximately 50 miles intervals along a 400 mile front of the inner and outer foothills. Each mine would occupy an area of two and one-half square miles, or about 20 to 25 square miles in total. This represents one sixth of one percent of the total forest and green area of western Alberta. Coal is comprised mainly of fixed carbon, which is an inert material, and its only toxic ingredient is pyritic sulphur. Alberta coal is extremely low in pyritic sulphur (about two tenths of one per cent). Because of the character of Alberta coal the possibility of discharge of acid water into mountain streams is extremely remote. The brief suggested that since coal mining occupies a very small percentage of the forest and green area of Alberta and that since stream pollution is unlikely, coal mining will not have any material effect on wildlife and recreation. With respect to water pollution at plant sites, the design of new preparation plants provides for closed circuit water systems, minimizing the possibility of water pollution. Modern plant design is such that the coal industry is now in a favourable position with regard to air pollution also. The real problem that it presented, thus narrows itself to physical pollution of air or water by discharged solids and appears to be minimal. The brief suggested that there is at present adequate legislation and departmental authority regarding the regulation of coal mining, exploration and development. One of the main problems regarding present legislation is to obtain approval of an overall plan because of difficulties in inter-departmental coordination. The brief stated that action by Government was welcome to augment and clarify organization and mechanisms for effective administration.

The brief urged that Government allow industry an opportunity to participate in the actual detailed development of specific regulations and recommended provisions for the right of appeal where regulations appear unreasonable or unworkable. Because of very great differences in the geology, geography and vegetative cover at each specific mine location, only general rules should be laid down in the Act. The brief deplored the suggestion that the Government should attempt to expropriate or otherwise acquire leases or other rights granted by the Federal

Government prior to 1930. Notwithstanding the concern about proposed legislation the brief iterated the industry's concern for restoration of the environment to a degree that is compatible with practicality. The brief suggested that legislation be framed to make the best possible use of resources, including the dependence of the high standard of living in Alberta on export commodities. It was emphasized that natural resources can be used without deterioration of the environment if that use is well planned in advance. It was suggested that there are areas which require further research before ultimate solutions are found, and it was recommended that joint government and industry activity be generated to find these solutions. With broad, enforceable control, agreements between government and producers before the start of a project is the only effective solution. Industry agrees that it should be responsible for cleaning up its own operations, but the cost benefit ratios should be kept in mind, because upon industry depends the prosperity of the country. With respect to environmental impact the industry brief concluded that increased activity in the coal industry will have minimal and temporary effect on the environment.

DR. TROST

We have been given to understand that reclamation costs may not be a high percentage of the overall value of the coal but may be an appreciable fraction of the profits. How difficult is it to pass on these costs to the purchaser of the coal?

MR. BARNES

In the mountains we are only beginning land reclamation and many respects we have no idea what the ultimate cost will be. At the moment, most of our coking coal companies are locked into long-term contracts with very small escalation clauses. Negotiations will be continually taking place with our customers, to try to absorb some of the additional cost.

DR. TROST

Your general position is to support environmental protection. What level of reclamation might be sensible from the coal operators point of view?

MR. BARNES

We are restricted by our market price for our coking coal. Operators



would be restricted in their measures to restore the land by the amount of money they could get from the market place. Their philosophy is to restore the land to as acceptable a position as possible, within the economics of the situation.

DR. TROST

The question of site selection has come up time and time again and you commented on it. You suggested that it might be appropriate, particularly in the mountains, that there be some site selection. Do you want to comment further on that?

MR. BARNES

I was referring to isolated incidents such as the small area adjacent to Jasper Park, an alpine area, that was mentioned by the Alpine Club in Edmonton. We might say "this is adjacent to the park and it is used by the Alpine Club; therefore we want to preserve it". However I do not agree that a temporary disturbance of the landscape should be a criterion for not developing it. The Government can impose reclamation restrictions or restore it to its former state or even better.

MR. BABEY

One of the submissions suggested that if we let our coal resources lie at the moment until other supplies are depleted that the market would strengthen and in the future could command a higher price.

MR. BARNES

If we sit on our energy resources we are going to find that we probably will never develop them. If we have economic potential for any of our resources at the moment we should develop them.

DR. SMITH

You estimate production at roughly 25 million tons a year, 80% of which would be open cast and 20% underground. You also say that this ratio will be drastically reversed. Are you suggesting that the real future for long-term development is underground labor intensive rather than open cast capital intensive mining?

MR. BARNES

Definitely. We are tending heavily toward open cast mining now because of the economics of the situation and the revenue that can be generated by the product. I am convinced that we are going to develop our coal

industry in the future and that this will predominately be underground operations.

CONSOLIDATION COAL COMPANY OF CANADA LIMITED

MR. M. S. CHOLACH

CALGARY

The Consolidation Coal Company of Canada maintains exploration and development offices in Hinton, Alberta, and owns 50% of Cardinal River Coals Limited. The brief is mainly concerned with technological advances in coal exploration and offers comments on certain segments of the proposed legislation.

The Company has been using conventional exploration methods in the Alberta Foothills since 1967. However, since 1970 it has conducted experimental surveys based on the following techniques: (1) Resistivity, (2) Magnetometer, (3) E.M., (4) gravity, (5) induced polarization, and (6) infra-red aerial photography. The best results (50% or better success factor) have been achieved with induced polarization. The necessary equipment for this technique can be carried in back-pack units which frequently results in fewer access trails and roads. By using induced polarization the Company has been able to reduce the amount of drilling and virtually eliminate trenching as a method of coal exploration. However, the technique is not fool proof and cannot be applied under all conditions. Even favorable results must be confirmed by drilling. The brief urges that legislation should be flexible enough to allow the development of other technological advances in exploration and mining techniques.

Concerning the proposed legislation, the Company feels that the interests of the people can best be served by open hearings on matters of public concern after appropriate legislation has been enacted. The brief does, however, agree that the administration of all acts relating to environmental protection should be centralized under one government body. It is suggested that serious implications result from government expropriation. In this regard, proposed legislation should apply to all

activities which disturb the surface of the land, not just mining. Reservation of wilderness areas is suggested as a reasonable alternative to expropriation.

The brief does not agree that a company should be held responsible for the actions of previous operators. Nor is it necessary to provide for penalties and imprisonment of violators of the proposed act; the security bonds posted by the operators give the province adequate protection.

DR. TROST

Your introduction of exploration techniques that are both more successful and less damaging to the environment was interesting. Is the induced polarization technique suitable in our low sulphur coals?

MR. CHOLACH

We are using this technique in our low sulphur coals.

DR. TROST

Would the presence of adjacent pyrites also give you a reading on your induced polarization measurements?

MR. CHOLACH

At the present time I don't feel that a theory of induced polarization can be adequately explained. We really do not know what makes it work. There are a number of possible theories: (1) the oxidation of pyrite within the coal seams, (2) the membrane effect where the immobility of the cation is increased relative to the anion, (3) it may be a combination of these membrane effects.

DR. TROST

Are you fairly sure that it is working?

MR. CHOLACH

We have accumulated a considerable amount of information during this year and we are relying almost entirely upon this method of coal exploration.

CANADIAN UTILITIES LIMITED [As of January 1, 1972 ALBERTA POWER LIMITED]

MR. GORDON CAMERON

EDMONTON

Canadian Utilities Limited generates and distributes the electrical energy for industrial, commercial, and domestic use. Although the company is not engaged in the mining of coal, it has an interest in the development of the coal industry in Alberta since it uses coal for the generation of electrical power.

The areas served by the company with electrical energy are principally east central Alberta and the northern part of the province, containing a population of about 210,000. The company's generating capacity is approximately 367,000 kilowatts of which 212,000 are installed at the Battle River station, using surface mined coal. An additional coal fired plant with a capacity of 150,000 kilowatts is presently under construction at Grande Cache and will be on line in 1972. By 1975 the bulk of the generating capacity will be concentrated in the Battle River Station (362,000 kilowatts) which uses sub-bituminous coal strip mined from the Forestbury/Halkirk coal field. Accordingly, this brief will focus upon the Battle River Station area.

The Battle River Station

Reserves of sub-bituminous coal contained within the plains region of Alberta are estimated at 7.4 billion tons. Of this total Alberta utility companies presently use only a minimum amount for the generation of electrical energy. The coal reserves contain within a five mile radius of the Battle River Power Plant are estimated at 100 million tons of which the station is expected to consume 70 millions tons over the next 30 years. In addition to supplying Albertans with clean economical electrical energy, the construction of a dam at the Battle River Station created a reservoir which is now the focal point of a new and popular provincial park.



### Electrical Energy and the Environment

Although electrical energy in its ultimate use is the cleanest form of energy available, the production process of this energy presents some problems. At the company's new coal fired thermal-powered stations the control of various pollutants is being monitored and large expenditures have been, and are being made, to minimize the amount of pollution produced by the operation of the plant. Canadian Utilities has centralized its production process in areas of low population density thus confining environmental disturbances to two or three localities.

### Aesthetics, Economics and Future Land Use

It should be kept in mind that surface coal mining is only one type of surface disturbance. There are numerous other examples of natural and man-made disturbances which, depending on your view, may be aesthetically unpleasing.

There is no economic basis for reclamation. For example, the market price of farm land in the vicinity of the Forestburg/Halkirk mining operation is about \$150.00 per acre, whereas reclamation to good pasture could cost in the order of \$1200.00 and to farm land possibly \$3500.00. In developing a cost benefit analysis for surface mining of coal in the plains region of Alberta the generation of electrical energy which results should be considered as a benefit which is widely defused throughout the Province. There is ample evidence to indicate that developments associated with the coal industry, such as a mine or power generating plant, do not result in a loss of municipal property tax revenues because of disturbances to the land surface. In the case of the Battle River Power Station the present assessed values are at least eleven times greater as a result of the mining of coal.

Although different sites lend themselves to different reclamation procedures, Canadian Utilities favours wildlife habitat as best satisfying aesthetic and economic needs for the area surroundings its Battle River plant. Regardless of the ultimate land use objective research expertise should be readily available from appropriate government departments.

### Recommendations

The company is in favour of strip mining legislation which reconciles the need for electrical energy with the needs of society to preserve the environment. Towards this end, the following recommendations are made:

1. Legislation and regulations should be broad enough to meet the objectives of a variety of reclamation plans.
2. The legislation should provide for producer participation in the planning process.
3. The legislation should encourage imaginative approaches to reclamation planning.
4. The legislation should not permit the uncertainties of open-ended costs to be placed upon industry, and particularly not retroactively.

### DR. TROST

This brief is particularly interesting in that it sort of closes the circle. We start off with coal and wonder whether we should use it and what its benefits are. Finally the coal is turned into energy and then the energy is consumed in our homes. For our own information and for a matter of record, could you tell us how the Canadian Utilities fits into this cycle, stressing the economic side of it. You buy coal under certain restrictions and you sell power under certain restrictions.

### MR. CAMERON

Yes, this is correct. As I said at the beginning, we do not mine the coal. We have contracts with coal companies who supply the product to us. It is at a prearranged price with an open end being that additional costs might be required by the coal companies to expand in the reclamation of the coal piles. We do pay an additional amount and of course we are naturally concerned that they get the best return from the reclamation efforts and developments so that we can also get the best price for them. What happens of course, is that we are a regulated utility, we have to appear before a public utilities commission

any time that we decide that we want a rate alteration and we have to justify our rate base. Then once that is justified, we have to convince the Public Utilities Commission that we are entitled to 5, or 7, or 10% return on our investment. This takes a great deal of time and is a great concern to us when we are dealing with a product such as coal where we are afraid there could be open ended cost which we couldn't do anything about because you cannot go running to the Public Utilities Commission and have anything happen over night. This process usually takes between 2 or 3 years from the time you put your arguments together and realize what it is you are going to have to come up with to satisfy them.

DR. TROST

You bear these costs as long as you can and finally go to the Public Utilities Board and you may say to them "we have these extra costs per ton and we therefore need to have the rates raised by so much." You have to come up with specific figures during the process at both ends?

MR. CAMERON

Yes, this is correct. I wouldn't want to leave the impression that just because of slight increases and reclamation costs, that we have to go through this lengthy process with the Public Utilities Commission. There are a number of things involved, the cost of mining is the main thing, interest rates, the demand on capital and on equipment and so on, but this would be part of what we would have to show as an increase in rate pay.

MR. BABEY

I am interested in what happens to the land after it is reclaimed on your particular area on the Battle River.

MR. CAMERON

Though again it is not our land, it's the mining company's. What has been happening so far with the reclamation on the north side of the Battle River is that each year there are more and more deer and smaller wildlife coming into the area through the brush. On the south side of the river we have a tougher situation. They have an awful lot of clay and very little glacial till or top soil and they are having a hard time getting

anything to take hold. Although they are very close, the two areas are separated by the creek; the area on one side is much simpler to reclaim to some sort of wildlife habitat. The closest town is about 7 miles away, right out on the bald prairie, and we sometimes feel that too many people refer to environmental pollution or aesthetic pollution, whereas it is environmental change and that doesn't necessarily mean pollution. It might appear ugly to somebody who is a flat land farmer who might appreciate flat land but to other people it might make a bit of a break in the horizon and may be quite appealing.

DR. SMITH

You compare the investment cost of land at so much an acre with another figure and I am not sure that I could agree. Investment costs even up to \$3500 in perpetuity on productive land wouldn't seem to me to take long to write-off. You people are now talking about 10, 15 years write-off on investment. I wonder is it really fair to compare an investment and reclamation costs on a total in perpetuity production with a national land cost.

MR. CAMERON

Here again, these are not my figures. The gentleman that worked them out may want to speak on them, but I think what we are saying is land that has been bought within the last 2 years in the area of \$150.00 per acre, with reclamation costs, is going to be \$3500 per acre and there is no further interest in the land as a coal mine or a supplier of electric energy. You must try to sell it and you are not going to get \$3500 per acre. I think this was the point that was being made in the submission. We are not saying that the land would never produce again but it would be difficult to change ownership and recover that cost factor.



CALGARY POWER LIMITED

MR. T. D. STANLEY

EDMONTON

Calgary Power Limited owns two coal strip mines, Whitewood and Highvale, located in central Alberta. The coal from these mines is used almost exclusively in the company's two steam electric plants located near Lake Wabamum. The company has been active in reclamation programs and maintains that prairie strip mining operations can be undertaken with no permanent damage to the environment, and under some conditions, better land use may be achieved following reclamation. Comments in the brief are restricted to strip mining on the prairies.

The Company predicts that its demand for coal will increase from about 9 million tons per year by 1980 to 22 million tons per year by 1990 and a substantial portion of this will come from prairie strip mines. Strip mined prairie coal provides the lowest cost energy presently available in the Province and reduces the demand on other sources of energy which are better suited to export.

The Company accepts the responsibility for carrying out necessary reclamation. It has worked in collaboration with various Government Agencies and contends that present legislation with regard to reclamation on the prairies is adequate. Since each strip mine is unique, the operators should have a major voice in the reclamation procedures and regulations must remain flexible enough to meet the varied circumstances. The brief suggests that rigid rules may increase costs but not necessarily improve the results. Furthermore ultimate use of the reclaimed land should not be decided upon too early in the reclamation procedure.

The costs of reclamation will vary from mine to mine but will likely be in excess of the original purchase price of the land.

It is desirable to have reclamation following as closely behind the mining operation as possible however, a working space must be maintained which necessitates a time lag (four years between mining and reclamation at Whitewood). Once the working space is established both mining and reclamation can proceed in step.

The first basic step in a reclamation program is contouring and the establishment of a vegetated cover. Beyond this point it is difficult to determine where reclamation ceases and development starts.

In general the drainage and water problems associated with prairie strip mining are minimal because of the low sulphur content of the coal.

Appended to the brief are summaries and photographs of the Company's operations at their Whitewood and Highvale strip mines. These describe equipment used, tonnages extracted, areas mined and reclamation procedures including the results of seeding trials.

DR. TROST

Would you elaborate on reclamation. At Whitewood I believe you said that you had improved on the original condition of the land through reclamation.

MR. STANLEY

There is a good bit of the Whitewood mine area which is muskeg. It was inaccessible for any use at all and really had no use. It grew some stub trees which were salvaged and used in the board plant near the Wabamum plant. The area is now a rolling area in which a car or truck can be driven at any time. It ultimately will be accessible to the public but because of safety reasons and configuration of the mine, it is not now so. It could even be used right now as a grazing area with alfalfa growing. There have been suggestions to develop it into a recreation area. I am sure that many snowmobile lovers would like to run over these rolling hills.

DR. TROST

It seems to me your basic position has been that although regulations should be flexible, reclamation to a certain agreed upon level should nevertheless be done.

MR. STANLEY

Reclamation, I think, is part of the whole picture. The point I was trying to make is the end result, the method of getting there. To disturb a mining plan too greatly during the mining operation could well increase costs greater than doing what would amount to extra work on reclamation and the same thing applies in the design of spoil piles.

The original design of the spoil piles should be for the mining plan and reclamation comes after. We have found this in the workings at Whitewood mine; that you had to feel your way along.

MR. BABEY

You mentioned that reclamation should follow closely behind the mining activity. I was wondering, in your experience in Whitewood, what time lapse is there between the opening of the pit and the completion of reclamation?

MR. STANLEY

We started operating there in 1962, but it was 1966 before we had enough room to start a reasonable reclamation program. We started south of Highway 16 to clean up some of the previous mining operations. If you look at the pictures of south of the highway, you would hardly realize that there has been anything disturbed there. We seeded some 200 acres last year, because of weather we lost a year in seeding and whereas we have some 640 acres disturbed we now have some 400 acres seeded. From now on we will keep right up but there is a time lag, particularly in a new mine. You have to have room to operate the mine and do a reasonable amount of stripping. You can't go and level one pile because it doesn't produce a good result.

DR. SMITH

Does it matter, in your opinion, whether the land is Crown land or private land? Should all land be reclaimed?

MR. STANLEY

Yes, I don't think that comes into it. Mind you, the land in which we are experienced is all land that the company has purchased. We are not in the forest reserves, but I don't think it should make any difference, as a matter of opinion.

PROCTOR AND GAMBLE CELLULOSE LIMITED

MR. DAVID D. SCHORES

GRANDE PRAIRIE

Proctor and Gamble is presently constructing a pulp mill south of Grande Prairie and has an interest in coal exploration and mining activity by virtue of its forest management agreement with the Province of Alberta. Although primarily concerned with the growing and harvesting of timber, the company believes in multiple land use and recognizes that there are areas in which the recreational or aesthetic values far away any other use. To this end, the company, in cooperation with the Department of Lands and Forests, has set aside over eleven thousand acres in eight locations for recreational and aesthetic purposes.

The company is concerned that mining exploration activities may considerably reduce the natural or recreational value of these areas, particularly the Kakwa Falls and Two Lakes areas. The brief suggests that any activities which disturbs the land surface or vegetation be excluded from these areas until Government studies underway are concluded.

The brief also indicated dissatisfaction with present exploration regulations and suggested that holders of timber management leases be given the opportunity to become involved in the overall resource management of the area.

DR. TROST

Are the lands you have given up still subject to exploration for other resources and for surfacing mining?

MR. SCHORES

As far as we understand, that is correct. To our knowledge there are such activities in the Kakwa Falls region. We do not think it proper that it be excluded from one resource development, in fact from a resource development which is renewable, it be allowed to develop other non-renewable resources.

DR. TROST

Could you describe how multiple resource developments have impact on



each other and the nature of the impact of strip mining on forest utilization?

MR. SCHORES

There are several impacts, the first of which is the removal of certain of the areas from productivity. The volume and productivity of a forest management area is of grave concern to us in the long range, and thus any area removed is land taken out of timber productivity. There isn't an immediate loss of timber, but we do ~~lose~~ the timber which is present if it is not mature or ready to be harvested under proper forest management. We have a tertiary concern and that is the development of too many roads into an area, the uneconomic development of parallel roads.

DR. TROST

So you feel that some of your problems could be handled by a proper cooperation between the various resource development operations?

MR. SCHORES

That is correct. In the areas which have been strong for recreational purposes we feel these activities ought to be curtailed. Throughout the forestry management area we feel that proper resource coordination could be obtained. We are working directly with a number of the oil exploration companies and have found a great deal of cooperation with these companies in this regard. We have not found the same with the coal companies.

DR. TROST

Now, the oil and gas people have been operating for some time and coal is to some extent a newer development or developing more rapidly recently. Is it just a matter of not having sufficient time to develop cooperation or is there something more intrinsic involved?

MR. SCHORES

I think it's probably a matter of time in developing the proper regulations in coordination with the Government agencies. I see no reason why these cannot be developed and coordinated. We have not been too successful thus far in getting it coordinated.

MR. BABEY

On the basis of your lease and the potential for forest management in your area, do you have an idea on what the productivity might be some time from now?

MR. SCHORES

We are in the process of obtaining some very accurate surveys of our own so that we can better assess it. We have indeed looked at it and the primary concern of a forest resource manager is that the drain from the forest is equal to or less than the growth potential. The drain may be from fire, insects, diseases and the man-made drain of harvesting operations. We can judge the man-made drain fairly well and we can regulate that. The regulation of a natural drain is a good deal more difficult. We do know that our forest management area is certainly not over-abundant with potential. We are concerned that there is not sufficient growth potential for the doubling of the pulp mill as laid out in the forest management agreement. So we do have a grave concern over its total productivity.

DR. SMITH

Mr. Schores, could you give us some idea of the productivity of the woodlands in those areas which were excised for recreation purposes?

MR. SCHORES

In terms of the 11,000 acres which we did voluntarily exclude from our forest management area, in the main these are highly productive lands.

DR. SMITH

Your company then, sees another value that must be equally as valuable to the people around here as the extraction process of forest products by setting these areas aside.

MR. SCHORES

That is correct. We are endeavouring to try to be a good corporate citizen in a number of areas and not simply try and make a dollar, though obviously we have to make a profit, but we feel that there are certain areas of such significant scenic value that they are worth more as recreational areas or as small wilderness areas than they are as a productive timber management unit.

DR. TROST

You have shown where difficulties are created for forest management by the presence of other resource developers. Can you think of difficulties that you create in utilizing the forest that then effect the coal operator?

MR. SCHORES

I would suspect that probably the most difficult situation that could develop in terms of us doing something that would affect them might be the matter of economics. For instance, we might without proper coordination, reforest an area after we've harvested the timber, only to find that the coal company in the next year or two, came in and strip mined the area thus having to pay us for the damage to the reforestation work that we did.

DR. TROST

If there were reclamation requirements for strip mining operations in your own managed area, what kind of reclamation would you think would be desirable from your point of view?

MR. SCHORES

There are a number of reclamation projects that I think would be pertinent and possible. Of course in areas that would be re-establishing timber, this should be done. I think what would be as much or even of more importance would be reclamation and that recognition of the watershed protection of the particular area. Our pulp mill would be a large user of water from the Wapiti River system and thus, we are quite concerned with the quality of water. I think that the water resource protection and the reforestation work are certainly two prime concerns for us.

PEGASUS EXPERIMENTAL METALS AND MINING LIMITED

MR. ALLEN FENNEL

EDMONTON

The public hearings on surface mining should include gravel pits, tar sands and any other type of mining which involves surface land disturbance. Similar reclamation regulations should apply to these operations as well as coal strip mining.

The brief contends that the more a company spends on reclamation the more is expected of it. Consideration should be given to reclamation costs in terms of tax abatements on equipment that is exclusively or principally used for land reclamation. The company estimates that its land reclamation costs run to \$1200 per day based on the cost of operating a D-8 bulldozer and a grader. This is acceptable since the capital costs of equipment can be depreciated now, but it is difficult to predict what the tax structure will be 15 years from now. Inducements should be used instead of "big stick" regulations. While people must be protected from pollution, if coal cannot compete on the international market it could seriously effect the provincial economy.

The company has just about developed the hydrogenation of coal at economic prices so is interested in the sub-bituminous deposits rather than the mountain coal. The company does not want the same regulations to apply to plains coal that cover mountain coal.

In essence, the company feels that the government should give some lead in showing that they will have tax relief for work that is done to meet their standards.

DR. TROST

In your statement on the same conditions applying to gravel and tar sands and their surface reclamation, did you have in mind that they should be reclaimed to the same standards as for coal mines?

MR. FENNEL

Yes. We get into a very difficult position if we qualify one material; either the land is disturbed or it is not disturbed.



DR. SMITH

I am not clear on your proposal for tax abatement.

MR. FENNEL

To give you a simple example: if you leave equipment or piles of equipment stock piled on the ground, you pay tax. If you build an enclosure to control the atmosphere of that equipment you pay tax, in fact the differential is 25 to 45. In other words, the more you do to stop wind drift of piles, the more taxes you pay.

DR. SMITH

So you are suggesting that, if efforts are purely for beautification or protection of the environment, this should be recognized in the tax structure.

MR. FENNELL

It is. The tax Act was amended April 1971 to allow this to happen, but discussions with the municipal authorities would prefer that this would be taken out of their hands. We agree and accept this for the capital structure which can be retired, but we disagree that this should be a source of revenue and infinitum for municipality.

IXL INDUSTRIES LIMITED - BRICK AND TILE DIVISION, MEDICINE HAT, ALBERTA

MR. L. O. LINDOE and MR. I.G. McLAUGHLIN

LETHBRIDGE

Mr. Lindoe stated that it was the philosophy of Medicine Hat Brick and Tile Division of IXL Industries Limited (1) to comply with all regulations regarding mining procedures and techniques, (2) to upgrade operations where practical where this will improve relations with other land users or reduce damage to the environment, and (3) to operate quarries at all times in a planned and orderly manner to achieve efficient mining and minimize damage to the environment.

Procedures and techniques presently used involve disposition of overburden in mined-out areas. reservation of topsoil for use in reclamation, construction of settling basins to control run-off, conducting exploration operations to minimize damage to the surface. The

Company promotes utilization of abandoned mines for such things as sanitary land fill, maintenance of slopes on backfills that conform to natural slopes, and conducting excavation works so that all slopes are left in a safe condition. Assistance is solicited from the government through the Departments of Agriculture and Lands and Forests to improve reclamation of disturbed land, and cooperation is entered into with the Department of Highways of Alberta in developing roads to resources.

The brief suggested that if stricter regulations are applied there should be more co-operation between resource developers and government agencies in the matters of road development through planning, and in developing research and methods for revegetation of disturbed land.

Where the public wishes to maintain resource development and environmental protection, there should be some cost sharing. Public spending could be involved with land reclamation methods, development of vegetable cover for reclaimed areas, development of mining equipment and techniques to maintain efficient mining operations while protecting the environment, developing other uses for abandoned mines and developing cost sharing programmes for building roads to resources. Public involvement would help to eliminate the duplication of research by individual firms in order to meet new regulatory standards.

The brief expressed concern with the proposed legislation. It was suggested that smaller companies cannot afford research concerned with the long range effects of strip mining. Mining operators privileges should not be revoked without sufficient warning to allow him to work out solutions to environmental problems or to develop new sources of supply. Time limits on reclamation should be flexible and companies should not be responsible for reclamation of a mine that was legally abandoned under past regulations. Removal, storage and placement of overburden and topsoil, as well as the time-lapse between opening and closure of trenches should take into account the variability of mining operations. The brief suggests that the use of contra-trenches in small quarries is very difficult, plus the fact that revegetation of spoil banks requires knowledge which does not exist and would be

extensive and difficult to acquire by quarry operators.

Regulations should take into account the importance of test pits in exploration and should not be eliminated by inflexible regulations. Regulations should provide for the use of road allowances in order to reduce the need for temporary routes during exploration.

DR. TROST

Could you explain your operation with respect to how special the clays are, whether they are in deposits that are stratified and extensive or are local in nature; what proportion of extracted material is useful, how special is it, and so on?

MR. LINDOE

Industrially usable ceramic clays represent a minute fraction of exposed clays. Under extreme conditions, 75 feet of overburden might have to be removed to get at less than 20 feet of clay. In some cases there may be a number of different strata separated by unusable material.

Usable clay materials may be found almost anywhere. Our quarries are on absolutely flat land where there is no place to put waste except alongside the hole. Subsequently all waste goes back into the hole. The company has made a policy of tidying up and backfilling whenever possible.

In about 1960 we made an abortive attempt to develop a property in the Bad Lands but it was unsuccessful. In this case we spread the material out, knocked down the sides of any pits so that it was not much different from the surrounding topography except it had no vegetation on it. We asked for help from three government departments but did not receive it. We would have revegetated this area, by hand, if we could have. We feel these difficult cases require the cooperation of government agencies.

DR. TROST

Are there reasons why it should be impractical in principle to coordinate the usage of various products, say coal, clay, sand and gravel if they were to occur simultaneously above each other?

MR. LINDOE

I think it would be easy to cooperate. One such example might be the

Wabamun strip mining operation where a brick plant was interested in one of the clays being stripped out from between the coal seams; the idea was abandoned. Another example is the fact that I-XL Industries stock piled about 30,000 tons of waste which was ultimately put into use. The concept is valuable but it requires a lot of long range consideration.

I would like to point out also that in the position statement items 2.1, 2.2 and part of 2.3 are very desirable statements of policy and principle that nobody could possibly find any objection to. This would apply to the producers, the people of the province and the government. However, as soon as we go past the point of principle and enter the mechanics of how to go about it, it becomes very restrictive. I thought: "Here we are going to have a bunch of quick restrictions that are going to have to be corrected by amendments year after year until finally they have all been weeded out again". However, in listening to the presentations, I feel that people are talking about cooperation rather than a specific type set of rules. I feel that the position statement is still a long way from understanding what the people of Alberta want done to accomplish their end as a generalized statement through their government.

DR. SMITH

Could you give us the actual geographical site of both the active and inactive quarries, the tonnage of mined products per year, the value of the marketed product and the number of jobs involved in the industry?

MR. LINDOE

The quarries under discussion here are producing about 120,000 tons of clay per year. There are about 300 immediate jobs per year, plus a bunch of secondary ones that are partly applicable to this. In this case the clay industry is converting minerals of rather low value into a very high relative value of jobs and products most of which are completely circulated within Alberta.



MASTER EXPLORATIONS LIMITED

MR. E. J. PANCHYSYN

RED DEER

The purpose of this brief is to outline the present regulations covering the exploration work for seeking coal and proving coal reserves in the foothills and mountain areas of Alberta. Coal exploration comes under the geophysical regulations for the Province of Alberta and these rules and regulations are provided under the authority of the Mines and Minerals Act, the Public Lands Act, the Forests Act and the Public Highways Act.

Operating Procedures:

Because of the scarcity of coal outcrops in the prairie regions, very little surface excavation or trenching methods are utilized. As a general rule most preliminary exploration work in the prairies is confined to road allowances. Exploration for coal in the "green area" of the province or that area which is forested with evergreen trees and which includes the bituminous coal bearing areas in the foothills and mountains of Alberta is of much more ecological importance and of very great concern to the public at large. A potential coal bearing area selected by a company for exploration work in the foothills has been preceded by a great deal of research work.

The brief contains an extract from a sample letter sent to the company by the Department of Lands and Forests which listed provisos to be followed during exploration of a particular area. Some of these provisos are: submission of a \$10,000.00 security deposit; description of access trails and precautions; re-seeding of soil in backfilled areas; crossing of streams; dumping of material into any water course; construction of trails within certain limits of any water course; the establishment of campsites, deposition of debris, clean-up and reclamation. The company was also to maintain contact with officers of the Lands and Forests Department and was to conduct the operation in a manner that would preserve the aesthetic quality of the area. It was pointed out that the authorization of this exploration

program does not in any way commit the Department of Lands and Forests to the issuance of a lease for mining. This non-committal is highly disturbing to anyone who is going to invest \$50,000.00 or up to \$5 million to explore an area and prove a coal reserve.

Master Explorations Ltd. has been active in exploration work in the foothills since 1964. The method employed by the company to examine and sample an outcrop of coal in the foothills is not by "bulldozer" but rather by "backhoe" whereby a two foot wide slot is cut into the coal up to 20 feet deep. A much smaller area is disturbed in this manner and can subsequently be backfilled. The company believes that recommendations made by the Consultant to the public hearings on strip mining are now in fact being carried out by responsible companies.

#### Costs:

As a rough guide it will cost \$100,000.00 to prove up 1,000,000 tons of coal, or approximately \$20,000.00 per acre of land is spent in exploration.

#### General Comments on Coal Mining Operations:

1. The value of an acre of land that is used for coking coal recovered by strip mining is considerably greater than the value of the wood that could be obtained from this acre. The coal may be worth up to \$290,000.00, whereas the wood may only be worth up to \$3,000.00
2. Siltation and turbidity visible in water courses during certain periods of the year is due almost entirely to huge amounts of solid material carried from talus slopes by spring run-off and heavy rains; run-off from surface mining activity is infinitesimal compared to the natural material.
3. Pre-planning cannot be accomplished if the Department of Lands and Forests is not committed to issue a surface mining lease after the exploration work has been carried out.
4. What are the alternatives to catchment ponds?
5. Underground mining is in difficulty because of the lack of mining labour; the only way to attract labour is to greatly increase wages.

6. The estimated remaining reserves of coal are 92% in the U.S.A. and 8% in Canada. Alberta contains an estimated 37% of Canada's reserves.
7. Briefs presented on behalf of industry have been done so by individuals who by the most part have no investment in the company they are employed by and who stand not to gain in profits, if any, of the mining operators.

DR. TROST

In Calgary a submission had been made to us describing a geophysical method of coal exploration. Do you want to comment on it?

MR. PANCHYSYN

This is induced polarization and we have used it, although in a negative manner, as we have to drill holes and recatch, lowering the quality. Induced polarization, however, will partially eliminate the need for access into areas for initial exploration.

MR. BABEY

It has been suggested that the use of a helicopter instead of the bulldozer for exploration could reduce environmental damage. Would you care to comment on that suggestion?

MR. PANCHYSYN

We use helicopters in our preliminary reconnaissance on many of our properties. We use geology maps put out by the Geological Survey of Canada and topographic maps put out by the mapping people with the Alberta and Federal Government. We also practice foot reconnaissance.

ABCON ENGINEERING (ALBERTA) LTD.

MR. W. J. BLACKSTOCK

RED DEER

History

The history goes back to 1911 when the first commercial strip mine opened upon the plains. There were few mines, however, until the requirements of World War II necessitated considerable expansion. The mining of the flat lying coal seams on the plains lent itself to strip mining very well, but the discovery of oil and natural gas created competition for the coal. Although there had existed underground mines, these were forced to close due to their high cost. Strip mines were able to compete and were successful in supplying the power utilities. In 1970 the production of sub-bituminous coal was 3,920,206 tons and the production of bituminous coal was 2,863,705 tons. Strip mining methods were used to produce most of this coal. Of the sub-bituminous coal, 97% was produced by strip mining, 80% of this was used as power plant fuel. Of the bituminous coal, 32% was produced by strip mining, and almost 100% of this was shipped to Japan as metallurgical coking coal.

It is estimated that in 1972 the total production of bituminous and sub-bituminous coal in Alberta will increase to 10,700,000 tons. It is also estimated that by 1980 coal production will be 20,000,000 tons, made up of 10,000,000 tons of bituminous coking coal, of which 50% will be produced by strip mining, and 10,000,000 tons of sub-bituminous coal, all of which will be produced by strip mining methods. The revenue the coal mines will receive in 1980 from the production and sale of coal is estimated to be in excess of \$80,000,000.

The Plains Strip Coal Mines

The coal seam in the plains area is usually of uniform thickness, flat lying, sub-bituminous coal, overlain with clays and shales and easily strip mined in large tonnages by large modern mechanized equipment. Exploration is fairly simple. Very little surface damage is done since most areas are easily accessible by municipal roads or through farmers' fields. The method of mining is as follows: the



overburden is stripped and put aside, the coal is then mined and the overburden from the new stripping section is dumped into the first cut. What is left is a series of consecutive parallel hills and valleys.

### Foothills and Mountain Strip Coal Mines

The coal-bearing formations may be faulted and folded or displaced, making it difficult to explore for, to find and to mine the coal. Exploration is more difficult than on the plains and, in its initial stage, is carried out by establishing the geology, faults, folds, coal outcrops and the dip or strike by surface investigation on foot or with a helicopter. Some hand trenching is carried out at this time to establish the thickness of the coal seam and its quality. Mining involves the removing of overburden, usually rock that must be blasted. This waste rock is usually dumped in an area removed from the pit and is not replaced at a later date. One of three types of pit is usually used to mine the coal:

- [a] V Type Strip Pit: the coal seam is dipping very steeply, it is usually a long narrow pit, usually the pit is not backfilled.
- [b] Glory Hole Strip Pit: a large volume of coal has been squeezed into one large pocket, large volumes of overburden are removed and when the coal is completely removed a large hole is left, water will form a lake in the completed pit.
- [c] V Type Strip Pit on Steep Side Hill: access becomes very difficult and must be planned so that overburden from each lift can be disposed of outside the pit area, the pit is left open ended and because of the grade on the pit bottom will drain without any difficulty.

### Employment of Personnel in Strip Mines

Criticism has been voiced with regard to the limited number of men employed in the mines producing strip mined coal. It has been said that more men would be employed if all coal was produced by underground mining methods, however, the problem is to find and obtain the labour necessary for this. With respect to productivity of the miners the following comparison can be made. Underground mining of

bituminous coal produces 7.68 tons per man shift; strip mining produces 20.08 tons per man shift. A miner in a strip coal mine will produce almost three times as much as a miner in an underground mine in the same time. Underground mining of sub-bituminous coal produces 6.86 tons per man shift; strip mining produces 62.15 tons per man shift. Strip mining can produce up to eleven times as much coal per day as can underground mining.

To mine underground 20,000,000 tons in 1980 would require approximately 16,000 men, while to obtain the same quantity of coal by strip mining would require only approximately 3,150 men. Actual estimates are that 3,000 men will be required underground and 2,000 men will be required for strip mining. Even now, when only 1,000 underground miners are required, it is almost impossible to find men who will go underground to mine coal. There are 2.7 men employed outside the mine to support each miner, therefore, by 1980 the coal mining industry in Alberta will be supporting some 18,500 families.

#### Reclamation in Strip Mines

Now that pollution and reclamation have become fashionable occupations, the strip mine operator is held up as the great desecrator of the landscape. There have been regulations in regard to strip mine reclamation and pollution laid down by the Department of Mines and these are obeyed by the coal mine operators. The coal mine operators in 1952 formed the Alberta Reclamation Association and, together with government agencies involved, assisted in drawing up these regulations. Briefs that have attacked the lack of land reclamation on the plains and in the mountains have failed to give the coal mine operator credit for living up to the regulations.

Regulations should be made to apply to the special conditions that exist at any time. Mining and operating techniques can usually be set up so that the destruction of valuable and irreplaceable resources is not necessary. Heavy expenditures should not be made to rehabilitate land that has little or no commercial value.

### Recommendations

1. Regulations should be set up so that they can easily be understood and mining operations can be carried on with a minimum of delay and harassment by the public at large.
2. Keep regulations flexible.
3. Give authority to competent knowledgeable people who understand strip coal mining to supervise the application of the regulations and to administer them.
4. The Right of Appeal should be incorporated into the regulations so that the operator may have the opportunity to go before a Board to have his case heard and passed on by otherwise unbiased people.
5. The regulations should provide for the recovery of natural resources where one resource is overlaying another.
6. Unbiased coal mining men of integrity and knowledge should be selected to referee and assist in protecting the environment and increasing the production of coal.
7. Right of Entry procedures should be established and the owners of surface rights should be heard and compensated.

### Comment

#### Mr. Blackstock

Mr. Blackstock indicated that the operators themselves are interested and concerned about reclamation and are cooperating with all people interested in this matter. He also stated that the utility companies will continue to increase their use of sub-bituminous coal for boiler fuel because such fuel costs substantially less than any other competitive fuel.

MACROPLAN CONSULTANTS LIMITED

MR. G. R. SHELLEY

EDMONTON

The major conflict in resource use and development is between renewable resources that cater to recreation and tourist activities versus non-renewable extractive energy resource industries. Tourism is expected to become Alberta's number one industry within 10 to 15 years; by 1985 tourists are expected to spend 1 billion dollars in the Province. It is obvious that we must protect the resource space of this industry particularly in the foothills and mountain areas of the Province.

In the case of strip mining as opposed to recreational land use, the following points must be considered:

1. From the standpoint of service, expanded recreation would offer direct and indirect benefits to more Albertans than would land use for strip mining.
2. From the standpoint of economics it has been estimated that travel alone has an income multiplier of \$2.43.
3. From the standpoint of environmental damage, both strip mining and recreation can pose serious problems. The damage caused by overuse in recreation areas can be as disastrous to the ecology as the more immediate results of strip mining.

The solution to recreational problems is long-range planning, while the solution to surface mining problems are related to reclamation. A more imaginative, functional reclamation approach is needed wherein the development associated with the mining operation can be taken advantage of for recreation purposes. This approach requires a comprehensive plan in advance of mining operations.

Almost any land area can be adapted to some form of recreation and the variety in topography and land features associated with strip mining should be utilized to the fullest extent in the planning stage. The brief offers the following suggestions:

1. Wherever possible reclamation planning should precede actual mining operations.



2. Where the unity of natural elements has already been destroyed, possibilities in manipulating the liabilities of the altered landscape should be fully evaluated. The various land forms and topographical features associated with surface mining operations should be viewed in terms of their acceptability to recreational oriented plan.

Legislation should make provision for coordinated planning, exploration, development and reclamation based on long range land use concepts and resource development.

DR. SMITH

Is it correct that you are suggesting a new and innovative approach to reclamation wherein a new land form may be as valuable or more valuable than a natural land form that existed previous to mining?

MR. SHELLEY

This is definitely the case. The parks and recreation areas in the foothills areas and our national parks are overcrowded and oversubscribed. We note from trends and statistics that the recreation demand within our Province will triple within eight or nine years. If we are going to meet this demand, we have to expand our resource base. Many of these mining operations in the foothills areas would be ideal sites for camp grounds, picnic grounds, trailer parks, and that type of facility.

NICK'S LANDSCAPING

MR. J. WOTHERSPOON

RED DEER

The brief noted that in many parts of the world where there are mining activities that there is a difference in attitude, not in problems, regarding mine reclamation. Reforestation and revegetation, forming of recreation areas is becoming a way of life in Europe. Here it always seems to be a fight between corporations and anti-pollution groups.

Several suggestions were made with regard to reclamation. Organic fertilizers, activated sludge, and recycled garbage are less polluting and longer effective than mineral fertilizers. Each mine site should be evaluated separately and classified into: (a) Wildlife and Forestry, (b) Agriculture and Prairie Parkland, and (c) Recreation.

Soil should be moved in such a manner that it can easily be replaced immediately after the mining; it could also be moved to form recreational areas, such as ski slopes. Because of the impact that development has on an area, considerable control should be given to the Government. In addition the Government should charge for services to helping industry.

# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA

SUBMISSIONS FROM  
ORGANIZATIONS, CITIZEN ASSOCIATIONS  
and OTHER GROUPS

ENVIRONMENT CONSERVATION  
AUTHORITY



## WILD KAKWA

MR. JIM BRAKENBURY

GRANDE PRAIRIE

### Introduction

Wild Kakwa, a Conservation Society, contended that wilderness is essentially a non-renewable resource, one subjected to commercial activities it ceases to exist. The long-term preservation of the recreational and aesthetic values of wilderness areas are more important than short-term resource exploitation.

### Watershed Protection

The Kakwa region is a major supplier of pure water to the Peace River watershed, one of the Provinces major sources of fresh water. Documented water pollution problems arising from strip mining in the United States are cited as evidence of the potential damage from this industry and it was suggested that there is not sufficient knowledge in this area to justify risking Alberta's supply of fresh water.

### Erosion

Examples of strip mining in the United States indicate that erosional problems are an integral part of these operations. In the plains area of Alberta, the problem of erosion may be less severe, but the mountain regions have a substantially fragile ecological balance with proportionately fragile erosion controls. Experiences in the United States indicate that reclamation efforts which are undertaken soon after the mining operation are more successful and less costly (\$500 to \$1000 per acre) than a delayed reclamation program (about \$1600 per acre).

### Reclamation

Reclamation costs may be considerably greater in the Rocky Mountains than in the Eastern United States. The brief estimated that reclamation costs in the Kakwa region may run to \$9,000 per acre; an excessive cost for most mining corporations. Nevertheless, experience



has indicated that in distinctive mountain environments successful reclamation cannot be guaranteed.

In the prairies, and to a large degree in the foothills, reclamation may be possible, if expensive. In all cases the time element is important; erosion and water table damage can only be minimized by replacing top soil immediately followed by adequate contouring and reseeding.

#### Recommendations

1. In any surface mining legislation the term "reclamation" should be defined as "the re-creation of the environment to the state it was in prior to the start of any surface mining or mining exploration."
2. Prior to the commencement of any exploration or mining operation, a thorough and specific study should be made to determine the possibility of reclamation, the capabilities of a company responsible for that reclamation and the costs involved.
3. No surface mining should be allowed to proceed faster than the reclamation of the area being developed. Provisions should be made to halt a mining development until the reclamation is judged to be of sufficient and adequate standard.
4. The companies which have maintained control of leases where reclamation is required should be forced to complete these reclamation procedures prior to renewing the development of these areas.
5. Prior to the granting of specific mining permits public hearings should be held.
6. Detailed plans should be prepared to avoid duplication of roads and other services and these plans should be available to the public.
7. In all areas where the recreational values are of significance, priority should be given to the maintenance of these values.

Specific Comments on the Kakwa Region

1. The recreational and aesthetic values of the Kakwa Region outweigh any commercial values and surface mining is a serious threat to the ecology of the area.
2. Reclamation, in the sense of replacing the original environment, is a physical impossibility in the Kakwa Region.
3. The Kakwa Region is an important source of pure water for the Province and we cannot afford to experiment with surface mining in the area.

DR. TROST

Your presentation indicates that if good management practices can be used, and you have given a series of recommendations, then your position on resource development, particularly strip mining, is as listed in your recommendations.

MR. BRACKENBURY

That is correct. Our general stand on strip mining is that under the conditions we have suggested, it may very well be viable, subject to the proper regulations. On the basis of the work by people involved in our organization, we are skeptical that the Kakwa Falls area should ever be opened up for strip mining. However, the whole area has been virtually leased out for exploration.

DR. TROST

What would your reaction be to underground mining in the area?

MR. BRACKENBURY

That would be an excellent subject for study. This should be considered as an alternative and weigh the two forms of mining against the consequences.

DR. TROST

These areas that you want as a wilderness area or a restricted area, do they happen to be endowed with resources of these sorts, and if so, which kinds?

MR. BRACKENBURY

Mr. Schores has pointed out that the area is quite valuable to them in terms of forest resources. It is quite apparent that there is oil and coal in that area.

DR. TROST

In your restricted access area, which in your description was the larger part of the area in the Kakwa region, would this area be accessible to resource development under proper management principles?

MR. BRACKENBURY

I think that it would, and under very careful coordination. In the restricted development belt we would see a certain amount of industrial development.

MR. BABEY

You stress the time element as being very important in terms of reclamation and the actual mining operation. Have you any thoughts on how the time element may be cut down.

MR. BRACKENBURY

I suppose you should only strip in a season what you can reclaim in the same season. We are worried about the stripping activities taking place and then snow fall in the winter and rains in the spring and the subsequent run-off losing a lot of top soil and causing damage to the water table. That is a personal comment.

#### ROCKY MOUNTAIN RAMBLERS ASSOCIATION

MR. H. G. PECK

LETHBRIDGE

I would like to deal with the operation of the Coleman Collieries Tent Mountain Strip Mine from the point of view of an ecologist.

The Tent Mountain operation is in two parts. The lower and active part is of little value from an ecological standpoint, but the upper portion on the divide is very valuable ecologically. Since the upper area has not been worked for at least ten years, it gives us a preview of what uncontrolled strip mining will look like in ten or more years after abandonment.

On Tent Mountain, a vegetation shows very little sign of return, and there is no sign of recovery whatever on the spoil tipple on the B.C. side of the divide. Wildlife is present, as proven both visually

and by tracks. Bird life is also present. With respect to water pollution, there is no problem here. Any physical or chemical contamination of streams must have ceased after the mining ended. There was surprisingly little erosion. With respect to slides, this is undoubtedly the most serious of any results of strip mining. On the Tent Mountain operation, there were a number of large cracks in the slopes above one of the cuttings; these clearly indicated an unstable condition. The area was comparatively small, but it clearly shows what indiscriminate soil moving can do on steep slopes with comparatively scarce vegetation to hold the soil. In addition, these results may not occur for years after mining has ceased.

As a remedy, it is proposed that no roads or grades, permanent or temporary, or any open workings, should be permitted to be made either up or across any slope having a grade within  $10^{\circ}$  of the angle of repose.

#### LETHBRIDGE NATURAL HISTORY SOCIETY

MRS. FRANCIS SCHULTZ      LETHBRIDGE

Mrs. Schultz stated that the present generation of Albertans must accept their responsibility to future Albertans, by considering not just the present but the future needs as well, both for energy resources, water resources and aesthetic resources. Any resource development, especially by such a potentially destructive method as strip mining, must be carefully controlled.

Before any extraction of coal or other minerals is carried out by strip mining, the following factors should be considered:

1. Reclamation

[a] What ability has the area to recover itself; is it suited by climate, altitude, and other physical characteristics to reclamation?

[b] What methods have been developed to accelerate reclamation of the site?



[c] Is proper reclamation planned and guaranteed by the company.

A bond of sufficient amount to cover the estimated costs of reclamation should be posted by the company before any development is permitted.

[d] A plan for reclamation should be prepared by the company, then regular on-site inspection should be made during the process of extraction and at the end of the project. If reclamation is not effective, there should be immediate termination of the permit, or suspension, until satisfactory reclamation has been done.

2. Balance of Costs

[a] Is the area of greater benefit to this and future generations if it is left in its natural state?

[b] Is there sufficient gain to the people of Alberta to justify strip mining?

3. Provincial Parks and Wilderness Areas

No amount of revenue can justify violation of these areas by strip mining operations, because they are valuable nonrenewable resources and must not be destroyed.

EDMONTON NATURAL HISTORY CLUB

MR. G. C. HAMILTON

EDMONTON

The Edmonton Natural History Club, with a membership of about 130 concerned citizens, accepts the position statement prepared by the Department of the Environment on surface disturbances from coal mining. The following suggestions are made to implement the policy:

1. Machine operators, sub-foremen and foremen should be required to prove their knowledge of environmental protection by earning a "ticket of competence" which would be recognized by the industry and government.
2. There is an onus on the Government of Alberta to implement a long term training and research program on land use planning.

Since the resource user must bear the cost of reclamation, and since the industry would eventually benefit from the accumulated information and expertise, the cost of the program should be borne by a levy on coal production.

3. There is a need for professional environmental engineers educated at the University level. Technical schools teaching conventional engineering and related skills should be required to give courses in environmental management such as erosion control, forest cover, soils and seeding techniques. By the same token, courses in biological science should include some instruction in practical engineering methods of earth removal, road and dam construction, etc.
4. Coal operators should be prepared to have their operations supervised by a qualified environmental engineer who would report to the Minister responsible for environmental standards.
5. Each year the government should set up a commission independent of the Civil Service to report to the Legislature on strip mining activities in the Province.
6. All contracts between coal producers and consumers should, by law, include a clause that delivery of coal may be delayed, reduced or cancelled, if the producer is unable to meet the requirements for reclamation and recovery.

ALPINE CLUB OF CANADA    EDMONTON SECTION

MS. JO ANNE CREORE    EDMONTON

### Introduction

The brief is directed towards the problems of surface mining in the mountains and foothills, specifically the development of adequate environmental safeguards in the form of legislation.

### Environmental Context

The authors contend that, to their knowledge, successful

procedures have not been developed for reclamation of strip mine areas in the Alberta foothills. It may be that even limited revegetation in some areas is not possible. Therefore legislation should provide for the exclusion of strip mining in the more fragile areas which may suffer permanent damage.

It is not always possible to contain the environmental damage caused by strip mining to a particular area, such as that caused by silting and chemical pollution of water courses. Present inaccessibility of a proposed mining operation does not invalidate the concept of public awareness and participation in the development of the mine.

Although the importance of surface mining to the provincial economy is recognized, it must be regulated to minimize environmental damage. If reclamation to the original state is not possible then alternate uses should be considered, in particular, recreation.

Exploration for coal in the mountains may be causing more environmental damage than the surface mining operations. If less damaging exploration techniques are available their use should be required by legislation.

#### Recommendations

1. All aspects of surface mining, including exploration, should be governed by effective legislation.
2. Before a permit to mine is granted, acceptable reclamation plans should be agreed upon. Alternate land uses may be acceptable.
3. The probable environmental impact of a proposed mining operation should be assessed by an independent agency. The operator must prove that adequate reclamation is possible.
4. Unique features of the environment which cannot be recreated or replaced should not be mined, and the operator should be aware of these restrictions before the exploration program begins. Financial compensation by the company for destruction of certain features is at best a deterrent; it cannot replace the aesthetic values which may be destroyed.

5. Public hearings should be required on all proposals which may cause permanent or environmental alteration of the environment.
6. All surface mining operations should be regulated, regardless of size. No mining should be permitted without reclamation.
7. The Government should contribute to research into reclamation methods for mountain regions.

DR. TROST

In your first recommendation, you emphasize the phrase "effective legislation" and there was discussion this morning on the contrast between flexibility and regulation in standards to be achieved. Do you have any choice between these alternate ways?

MS. CREORE

I think that very much depends on the nature of the environmental problems of the region. I think that by "effective legislation" we would emphasize that it prevent any mining without reclamation but would not necessarily lay down such rigid guidelines that the companies have no flexibility to suit their reclamation timetable and methods to the region involved.

DR. TROST

So you emphasize more the result that is produced?

MRS. CREORE

That's right.

DR. SMITH

As you may be aware, in the United States an impact statement is filed by a company proposing to conduct programs which has significant impact on the environment. This is then reviewed. In each case, the company is required by law to file a statement which generally results in a part of government deciding whether its efficient or acceptable. Do you think this might have some feasibility in our area of Canada?

MS. CREORE

I don't see why not. Perhaps it does not matter whether the government reviews after the statement is put forth, or the statement should originally come from an independent agency.



NATIONAL AND PROVINCIAL PARKS ASSOCIATION OF CANADA

EDMONTON CHAPTER

MR. DON MEREDITH

EDMONTON

The National and Provincial Parks Association endorses the brief presented to the Provincial Government by the Alberta Land Conservation Society in 1969. Further to this, the Parks Association submits a series of recommendations relating to strip mining which are summarized as follows:

Park Oriented Recommendations

1. Rocky Mountain National Parks are approaching their limit with regard to recreational use and cannot accomodate many outdoor activities while still preserving a wild natural environment. Albertans, therefore, are in great need of provincial recreation and wildlife lands, which are rapidly disappearing reasonably close to the centres of population. The foothills offer an ideal area for such lands, but they are now threatened by extensive strip mining for coal.
2. Concern is expressed about the fate of Wilmore Wilderness Park and the White Goat, Siffleur and Ghost River Wildernesses. These four areas should be studied very closely before mining expands, to see whether they would indeed be of more long term value left as they are in use for recreational and wildlife purposes.
3. Successfully reclaimed strip mines have provided good wildlife habitat for some species and opportunities for certain types of recreation. While this is certainly preferable to a non-reclaimed mine site, there is nevertheless a real need for the preservation of wilderness areas unaltered by human development.

Ecologically Oriented Recommendations

1. Environmental professionals are required to study the ecological, hydrological, geographical and recreational features of the

- foothills, in order to advise appropriate land use. Any regulatory board should be in the Department of Lands and Forests, not in the Department of Mines and Minerals.
2. A comprehensive long-term (longer than 20 years) cost benefit analysis is required of the various possible land uses in the foothills.
  3. A complete hydrological survey of both surface and ground water movements is required before a permit to mine is issued in the foothills.
  4. No alpine areas (near and above tree line) or slopes in excess of 33° should be strip mined for the following reasons:
    - [a] Water courses have their origins in the alpine areas and contamination of water at the source could have detrimental effects at all downstream locations.
    - [b] Although total annual precipitation is not high, the upper elevations are subject to violent storms which could cause severe erosion problems.
    - [c] Re-establishing organic soil and vegetation on disturbed areas at high elevations or steep slopes is extremely difficult, if not impossible. Present plant growth is barely sufficient to prevent erosion.
    - [d] Wildlife habitat at higher elevations is very prone to damage and species populations could be severely depleted by contact with man and his mining activities.
  5. Physical restoration should aim at recreating a mountain's original profile rather than the present method of contouring.
  6. Plants used for re-vegetation should be species native to the local area; introduced species could cause undesirable changes in the natural plant communities.
  7. Rigid regulations should be drawn up for underground mines as well as strip mines.
  8. All abandoned mines should be reclaimed regardless of cost.
  9. All exploration trenches must be properly reclaimed, filled

in and planted; and all roads minimized in number, approved before construction and reclaimed if not required for subsequent access.

NATIONAL AND PROVINCIAL PARKS ASSOCIATION    CALGARY-BANFF CHAPTER

MR. CHRIS DUNKLEY      CALGARY

The National and Provincial Parks Association endorses the principles for proposed surface mining legislation prepared by the Department of the Environment. The Association also agrees that (1) the resource user should be responsible for reclamation costs; (2) comprehensive environmental planning is necessary before permits are issued to mine developers; (3) public hearings should be held on certain types of developments; (4) the Province should be authorized to acquire exiting and prior rights to resources under reasonable terms of acquisition. Furthermore, the brief submits that environmental factors must receive priority consideration before any exploration or development be given and proposed regulations should apply to all surface disturbances.

Strip Mining

Given the projected demand for coal and the extensive deposits in Alberta, it is logical to assume that strip mining will rapidly increase in the Province. By the same token, scarcity cannot be used as an excuse for tolerating ecologically or socially unacceptable methods of extraction.

Financial Responsibility

It is essential that reparation deposits or bonding requirements be very tightly enforceable. The brief recommends that when the Department of the Environment issues a permit or enters into a contract with a developer or mine operator, a "contract fee" or "reparation fee" should be levied in an amount that is sufficient to meet the full costs of eventual reparation.

### Cost Benefit Analysis

Mineral development must not automatically take precedence over other resource possibilities. Instead we must weigh the short-term benefits of mineral extraction against the long-term potential of the other resources. The brief suggests that a Board of Review, under the Environment Conservation Authority, should have authority to assess this balance of priority between the extractive industry and the future long-range potential for other resources. It is only by such an assessment that the "social cost" and the "social benefit" can be weighed. It should be recognized that banning strip mining in areas where permanent damage is likely to be done may impose hardships on a few, but generations of Canadians will benefit. The brief suggests that without strip mining in a given area, the tourist potential and the whole recreation industry could expand to provide for greater job potential over a much longer period of time.

### Watersheds and Siltation

The watersheds of the Eastern Rockies are vitally important. A study conducted in Kentucky reveals the potential threat to this resource from strip mining. Two adjacent watersheds were studied; the value that remained in timber yielded 27.9 tons of silt per square mile annually and the other, which had been heavily strip mined, lost 30,000 tons per square mile annually. Water is a resource of great value to Alberta and its quality and quantity must not be adversely effected by strip mining operations.

### Scenic, Recreation and Aesthetic Values

Although coal bearing formations run almost the full length of the foothills in Alberta, careful consideration must be given to scenic, recreational and aesthetic values of land in this area before strip mining is allowed. Increasing trends in urban populations, mobility and leisure time indicates that the recreational values of the foot-



hills will increase rapidly.

#### Canmore Recreational Potential

Specifically, the brief suggests that strip mining in the Canmore area of Southern Alberta may be economically unsound even if reclamation is eventually affective. The unsightly activities and results associated with strip mining may deter recreational developments in the area which could take advantage of the proximity of the National Parks. Furthermore, there will be increasing recreation demands made on the area by the large urban population of Calgary. For these reasons the brief recommends that permission to strip mine more land in the Canmore region and Bow Valley Corridor be denied.

#### General Comments

The brief submits that no one generation owns the productive capacity of our land. Albertans are the custodians of a great natural environment and future generations have the right to inherit a land which will meet their material and aesthetic needs.

Society must develop a new set of values based on the conservation of air, water, quietude, productivity of the soil and aesthetic assets of our environment. Is it not possible to replace the gross national product with a new statistic which could be called the net social benefit? It is the reconciliation of the four principle elements of conservation - preservation, protection, managed use and restoration - that provides the guidelines for developing a practical legislative base.

CALGARY FIELD NATURALISTS SOCIETY

MR. IAN HALLIDAY

CALGARY

The Canadian Field Naturalists Society suggests that when destruction of economic and aesthetic values are considered, there may be no long term benefits to the people of Alberta from strip mining. Many costs must be added to mining expenses and assessed before mineral extraction takes place.

The Society is particularly concerned with ecological damage which could result from strip mining in the Crow's Nest to Smoky River area in the foothills of southern Alberta. Particular concern was expressed about the exploration activities which are taking place at higher elevations and the possible environmental damage which could result to these fragile areas.

Regulations should require that archeological and ecological surveys, as well as studies of the economics of alternate land uses, be undertaken before strip mining in a given area is permitted. Research is also needed on the reconstruction of soil profiles, the use of native species for rapid vegetation of bare soil surfaces and the recreation of original native plant communities. The brief submits that these highly complex problems must be solved by the operators before the strip mining is carried out.

If strip mining is to be permitted then new laws or regulations are required to govern the manner in which mining may be conducted and land reclamation procedures to be followed.

Land reclamation must be carried out by all strip mining operators as soon as possible after the coal has been removed from the site. The cost of conducting surveys, research and reclamation procedures should be borne as much as possible by the mine operators.

There are many scenic areas and plant and animal species which are unique to Alberta and their preservation should be considered more important than the short term benefits derived from strip mining. Land reclamation measures must include the following:

1. Replacement of the original subsoil and topsoil in their proper sequence and as nearly as possible to the original land forms and contours.
2. In forested land all timber should be salvaged and organic debris should be returned to the soil.
3. The land must be restored to its original native vegetation immediately to prevent water and wind erosion of the bare soil surface.

THE BOW VALLEY NATURALISTS CLUB

MR. MICHAEL D. McIVOR

CALGARY

The Bow Valley Naturalists Club accepts the premise that development of natural resources is inevitable and environmental damage will occur. Strip mining in the mountains not only poses difficult restoration problems, but interferes with or precludes the development of the land for other uses such as water, recreation and aesthetic beauty. Environmental problems may occur considerable distances from the actual mine area as a result of road construction, blasting, water pollution and the disposal of mine wastes. One special area which deserves study is the effect of coal dust on the melting of snow and the consequent impact on vegetation and drainage systems.

There is no supply or demand evidence to indicate that our mountain coal reserves must be developed immediately. In fact, alternate land uses in the mountain areas may result in a great contribution to the provincial economy.

As technology advances the coal reserves amenable to strip mining techniques will increase and, for economic reasons, underground mining will decrease. Perhaps, stringent controls on surface operations would encourage a return to underground mining; this would be more expensive economically, but less costly environmentally and socially.

The brief contends that the Province should be cautious about selling our natural resources to foreign markets. Cost benefit analysis

are urgently required to determine the relative economics of mineral production vs. recreation in the mountains. The value of recreation must be reckoned in economic terms, as well as aesthetic and cultural, with due consideration given to increasing trends in population, recreation demands and leisure time. Similarly the potential environmental damage from strip mining should be projected into the future when man's ability to destroy the landscape may be greatly increased.

Governments must recognize that national parks cannot continue to meet increasing recreation demands if they are to remain unimpaired for future generations. Mountain areas outside of the national parks are suitable for artificial recreation and tourism and these developments should be encouraged.

Big game populations in the Rocky Mountains are declining due to destruction of their habitat by resource developments and the extra hunting pressures resulting from road construction. Before exploration or development permits are issued in the mountain areas, studies should be undertaken to ensure that wildlife ranges will not be disturbed.

The brief focusses attention on the importance of the mountain areas in watershed control and suggests that strip mining could eventually effect water supplies on the prairies. The total impact of strip mining in the mountains should be studied with a view to banning it in areas of high watershed value.

The brief contends that for a variety of environmental and operational reasons strip mining above timber lines will result in irreparable damage to the natural and aesthetic values of these alpine areas. An immediate ban on all strip mining about 6,000 feet is therefore recommended, and all surface exploration activities above this level should cease immediately.

If strip mining is allowed to continue in certain parts of the mountains, then strict regulations must be developed to ensure an acceptable minimum of environmental damage. The proposed legislation should also allow individual citizens or groups to initiate legal proceedings against companies or governments causing environmental damage. The legislation should also require the cleaning up and



reclamation of areas stripped at any time in the past, by operators now in business. It should require operators moving into areas formerly stripped and abandoned by other companies to attend to reclamation matters before proceeding with any new operations. In areas where no accountable parties can be identified, reclamation must be undertaken by the Government.

Present attempts at revegetation in the mountain areas are not satisfactory. Ecological stability in these areas demands that the diversity of natural plants originally growing on the site be restored as quickly as possible following the mining operation.

It is suggested that Alberta is in a position to take advantage of the successes and failures of standards applied to strip mining operations in some of the United States. For example, legislation in Montana is open to interpretation or ambiguity and should be avoided; adequate legislation should provide a body of explicit and fixed standards. Many features of the legislation in Kentucky could be modified for use in Alberta, such as 1. strip mining comes under one piece of legislation, 2. the reclamation council is made up of members from various resource departments and 3. the requirements are specific and the penalties are known.

A comprehensive system of minimum standards should be established and enforced. Beyond this, each company applying for a permit should be required to submit a plan for reclamation along with estimates of costs pertaining to the minimum standards established. A performance bond of 200% of the estimated costs of minimum reclamation should be posted, and any company forfeiting a bond should forfeit the right to any future permit.

Exploration of coal, aside from potentially expanding the strip mining operations, poses special environmental problems of its own and there is urgent need for less damaging methods (example, helicopters).

The brief suggests that the strip mining industry in the past has been based on a hasty, careless extraction of a non-renewable resource with little regard for environmental considerations. However, society's values are changing and the public is demanding a more comprehensive, farsighted land use policy.

ALBERTA WILDERNESS ASSOCIATION

MR. GRANT McNABB

CALGARY

The Alberta Wilderness Association is an organization dedicated to the preservation, conservation and wise use of Alberta's wilderness and wild land habitat. The Association contends that the public hearings should have considered the entire question of energy resource development rather than the more limited concern of strip mine reclamation. It also contends that there was not sufficient time given for preparation of adequate briefs.

The brief is primarily concerned with the conflict between mineral and energy resource development and other incompatible surface land uses. In such cases the fate of the land should be decided only after public debate and on the basis of cost benefit analysis of all alternative land uses. Benefits and costs should include not only those of an economic nature, but also those of a social nature.

The brief contends that at the present time we do not have a clearly defined and sound land-use policy. Because of this the Association pleads for a moratorium on any new coal mining projects and related surface disturbance activities within the foothill and mountain regions of Alberta. The moratorium should remain in effect until a sound land use policy has been developed and approved by the public. In connection with such a policy, the Department of Lands and Forests should undertake an inventory of all lands in the Province with the object of setting aside areas which qualify as recreation or wilderness areas. It should be recognized that through careful planning uses other than recreation (even coal mining) may be compatible with the concept of wilderness and wild land uses.

An important factor in the role of coal mining in a comprehensive land use policy should be the marketing picture for that coal. In that context we might anticipate a five to ten fold increase in production rates over the next twenty-five years, and ultimately the value of coal produced in Alberta could exceed the value of oil presently being produced. Given this potential for increase guidelines established in the

next several years could have a profound effect on the environment and future well being of Albertans.

Alberta coal reserves are estimated to be adequate for 500 years. However, the brief contends that every effort, including the expenditures of research monies, be made to more intensively mine those areas already committed to development before authorizing any new developments. All aspects of the economy of coal mining must be thoroughly examined before policy decisions are made. The costs and benefits of proposed coal developments must be weighed against the costs and benefits of alternate land uses.

The brief expresses extreme reservations about strip mining activities within the mountainous river head water areas. These areas play a critical role in determining the summer flow of water in prairie river systems. Consequently when even a small portion of an upland area is destroyed the resulting effects are often far out of proportion to the area initially disturbed. The preservation of wildlife habitat is another area of concern.

The brief urges the Provincial Government to give greater recognition to the increasing recreational use of public lands by non-resident visitors and the resulting financial return to Albertans. Exploration and mineral development may be incompatible with this other "industry". This potential should not be ignored when making land use policy decisions.

The following points were raised in connection with the proposed surface reclamation legislation:

1. Any legislation should have as its basic intent the complete prohibition of strip mining in certain terrains or under certain environmentally socially defined circumstances, and strong regulation of all remaining surface mining.
2. It must be the onus of the exploiter to prove that he will not do irreparable damage and the developer should also be held responsible for the ultimate success of his reclamation procedures. The possibility of providing individuals the legal recourse to protect their interest in the environment should be open to further study and political argument.

3. Public hearings are one way of expressing public opinion, however, hearings do not replace the courts which are designed to resolve conflicts.
4. The following suggestions were made with regard to reclamation standards:
  - [a] Overburden should be removed by strata, stockpiled, and replaced in proper order in the course of backfilling.
  - [b] The overburden should be compacted to a minimum bearing load of 3,000 pounds per square foot after five years.
  - [c] Reclamation plans must include a timetable and a posted bond should be withheld until the timetable has been met.
  - [d] Strip mining should be prohibited in certain areas.

DR. TROST

In cost benefit studies one always comes up with dollars for and dollars against. You are emphasizing the need to also look at benefits of a social nature. How would you propose that these be weighed as against those costs that can be quantified?

MR. McNABB

One, the area deserves study. Secondly, this is often a political decision, in other words, how much do people appreciate the value of the land that is about to be disturbed? This social cost is best made explicit in public hearings as you suggest in your prospectus. We also think another way to look at it is to make overlays of potential resources uses in dollar incomes from various areas. If we consider destruction in terms of recreation, we might have a start at trying to get at the costs of these things.

ALBERTA WILDERNESS ASSOCIATION

MR. W. J. DITCHBURN

RED DEER

This brief was identical to that submitted by the Alberta Wilderness Association at the Calgary public hearings. It is not repeated here.



CANADIAN WOLF DEFENDERS AND DEFENDERS AND WARDENS OF NATURE (DAWN)

Brief prepared by MR. R. GUEST and MR. D. ROLES; read by MR. W. A. FLOOK

RED DEER

In an age when the global impact of pollution and environmental destruction could influence the well-being of future generations, strict, enforced legislation will be necessary to ensure that industries will do their fair share to preserve the environment. The following points should be considered in drafting legislation:

A. Reasons for Concern

1. Strip mining often adversely affects wildlife habitat, precaution must be taken.
2. Strip mining is notorious for defacing countryside.
3. The industry, with some exceptions, has a very poor record of land restoration and reclamation.
4. Strip mining tends to destroy natural watershed.

B. Information should be made available to the public on all aspects of mining operation and a government statement should be issued, describing to Albertans the benefits to be derived from any area which is to be strip mined.

C. A board should be formed for the implementation and enforcement of environmental quality legislation.

D. Leases for strip mining should be granted only after certain specific conditions are satisfied:

1. Where strip mining is proposed near scenic areas a public hearing should precede each granting of a lease.
2. The total estimated cost of reclamation should be paid for in advance.
3. Leases should not be granted to any company which has a poor record of reclamation.
4. All employees of mining companies must leave wildlife in the environs of strip mining areas unmolested.

POLLUTION CONTROL - SOUTHERN ALBERTA

DR. PAUL D. LEWIS

LETHBRIDGE

Of the potential sources of energy (atomic power, hydro-electric power, natural gas and coal) coal represents the most abundant, readily useable fuel source in Alberta. Up to the present time environmental considerations with regard to coal mining have received little or no thoughts; few mining operations have included even superficial reclamation. Up to 1964 1,759 coal mines were licensed in Alberta, but only 55 of these were still in operation at that time. The brief stressed that these figures demonstrate that proposed legislation must deal comprehensively with mining, and not be limited only to strip mining. The brief contended that coal mining as in the past produced a source of energy which had appeared to be cheap at least partly because the social and environmental costs of the development of coal mining have not been included in its actual cost. Social and environmental cost such as the effects of surface disturbance on water retention and quality, wildlife habitat and recreational and wilderness areas are difficult to assess, but unless some way is found of including them in cost benefit analysis, false economies will result in resource development.

In the mountains, special problems are related to the precipitous nature of the terrain, rigorous climate and the fact that major watersheds have their head waters in the mountains. Climatic and topographic features work against quick reforestation, top soil is thin, and water retention characteristics are fragile. In the foothills, the economics of mining must be balanced with the value of land for other purposes including recreation and aesthetics, water, timber etc. The value of foothills areas for tourism and recreation will continue to increase long after non-renewable resources have been depleted. Special problems on the prairies may include wind erosion and air pollution by dusty, a competition with agricultural production and water pollution,

The future of coal mining in Alberta must take into account that there are some areas where reclamation is presently impossible. Environmental consideration must be overriding in the determination

of whether or not to allow exploration.

With regard to exploration, the brief recommends that strict control be exercised over exploration for coal and that exploration permits be granted (a) only in those areas where ultimate development is not contraindicated (b) only where appropriate prerequisite plans have been submitted to indicate environmental impact and how disturbances will be reclaimed, and (c) only upon the posting of a performance bond. In addition consideration should be given to the time of year during which exploration can be permitted. With respect to the actual operation of surface mines the brief suggests that an application for a permit to operate a mine must contain a detailed statement including (a) environmental impact, (b) alternatives which have been considered, (c) plans for reclamation and (d) posting of a performance bond. A maximum allowable time limit should be set for disturbed land to remain unrestored. As a general rule, the brief recommends that grading be done within forty-five days after coal is removed. Penalties for infractions of regulations should include warnings, stop-orders, fines on a per basis, forfeiture of performance bond in total or in part, and refusal of additional and subsequent permits for exploration or operation.

The brief recommends that any presently abandoned underground or surface mine, encompassed in an area where a permit for operation is applied for, be included in restoration plans accompanying the application. Authority to confer reclamation certificates, indicating satisfactory performance of reclamation should be vested in the Department of the Environment. Proposed deviations from statutory regulations should be regarded as public knowledge, indicated in writing and subject to public hearing by the Environment Conservation Authority.

DR. TROST

You mention environmental and social costs in your introduction. Could you give us an example of social costs related to strip mining?

DR. LEWIS

The kinds of things that I had in mind include such things as: deterioration of water quality; siltation and erosion which affect downstream users.

As a second example, if large scale stripping operations take place in the prairies, and if there is a loss of productivity as far as the soil is concerned, this would have severe ramifications for the economic future of southern alberta.

MR. BABEY

You mention the possibility of reducing soil productivity. With the application of modern techniques, is it possible to reclaim the land in order that it may be as productive or even more productive than it was before the stripping operation?

DR. LEWIS

I think that in many cases this is so. In some cases in Kentucky and Southern Illinois, land which had been of very little value is now quite attractive in the reclaimed state.

#### INTERDISCIPLINARY COMMITTEE FOR ENVIRONMENTAL QUALITY

DR. E. E. DANIEL

EDMONTON

#### Comments on Public Hearings

The brief emphasizes the importance of providing public hearings on matters that seriously affect the environment, such as strip mining. However, there must be adequate public dissemination of background information prior to the hearings and sufficient time to allow the preparation of useful briefs. Much more information should have been available. Since the consultant's report and the summary supplied by the Department of the Environment are obscure in some areas, representatives of the Provincial Government should have been available at the hearings to provide further information.

#### Positive Aspects of the Proposal

##### Consultant's Report

The brief strongly endorses the following points made in the consultant's report.



- [a] A comprehensive land use plan for the entire foothills and mountain regions of Alberta.
- [b] The foothills area has a high recreation potential and reclamation should be planned to enhance this potential.
- [c] Subjective decisions will have to be made with regard to the social costs involved in a cost benefit analysis of surface mining in Alberta.
- [d] Permit applications by operators should be accompanied by a detailed management plan which, if approved, would be strongly enforced.
- [e] Habitat for highly vulnerable wildlife species must be protected to the point of excluding such areas from mining activities.
- [f] Recommendations for further studies as noted in the consultant's report should be acted upon. A total land use plan for the foothills and mountain regions of Alberta should be started immediately.

#### Department of the Environment Statement

The brief fully supports the following statements contained in the document presented by the Department of the Environment:

- [a] The need for comprehensive and environmental planning before resource exploitation commences.
- [b] It is the responsibility of the resource user to prove that environmental damage as a result of his mining activities will be minimal or satisfactory.
- [c] Development proposals should be reviewed before the issuance of an exploration permit.
- [d] Reclamation should proceed simultaneously with operations.
- [e] Performance bonds must be deposited by the operator.
- [f] Operators violating conditions of the Act should be subject to fine and prison terms.

## Problems and Unanswered Questions

### Consultant's Report

he lack of any clear or specific recommendations on monitoring and enforcement of management plans is a serious weakness. To avoid possible political ressure the inspection and monitoring agencies should report to the government rather than the reviewing body.

### Department of the Environment Summary

Effective legislation depends upon adequate enforcement. A multi-departmental approach to enforcement, as suggested in the summary, could lead to inconsistencies and a lack of organized planning. The summary fails to make clear where the responsibility for enforcement will lie; planning and enforcement to be the responsibility of the same agency? The brief contends that planning and enforcement should be under separate, permanent review bodies and their operations should be open to public scrutiny.

The summary does not make it clear whether public hearings will be mandatory on all important resource allocation decisions or merely those of a renewable nature. The brief contends that public hearings should be mandatory on all important environmental decisions.

Section 2.4 of the summary, dealing with financial compensation for environmental damage, should be clarified. Does it mean that if replacing or recreating an environmental feature is impossible, the resource user may be allowed to destroy it for a fee?

The brief does not agree that a retroactive time period be established for reclamation of derelict land. These lands should be reclaimed if at all possible and their recreational potential should be given careful consideration.

STOP (SAVE TOMORROW OPPOSE POLLUTION)

MS. KAREN MOLGAARD      EDMONTON

The brief recommends that conservation should have priority over exploitation and the laws dealing with strip mining activity should be changed. Control of environmental damage has been successful in places like Kentucky where the problems are similar to those in Alberta. This was achieved without adverse effects on the industry.

Reclamation of strip mines in the plains of Alberta offers no serious technical problems, only administrative ones. The Forestburg and Wabamum Mines are cited as examples of poor reclamation planning in the past, although present reclamation procedures at Wabamum returned the disturbed area to an acceptable condition.

It is more difficult to protect the environment from strip mining in the mountains although the slope - reduction technique developed in the United States should be used in Alberta. Nevertheless, there are certain areas in the mountain regions of Kentucky in which strip mining is prohibited.

British Columbia and Alberta have competed with each other for the coal industry business by offering better deals. Likewise, Japan is playing Canada and Australia against each other to obtain the best possible import arrangements for coal. Meanwhile, the environment has suffered.

With regard to mountain strip mining carried on in the past, in some instances the damage may be considered as permanent, yet this is the result of small undertakings compared to those planned in these areas now. The environmentalists are primarily concerned about the mountains. Coal must not be used for the construction of roadways and overburden cannot simply be pushed over the side of a mountain. The damage caused by these types of practices are difficult to rectify and in the long run may out-weigh the benefits derived from the coal industry.

Exploration for coal in the mountains can be as damaging as the mine itself. Although attempts were made to fill in the scars made by bulldozers, these are frequently inadequate. Knowledge is available on how to minimize the damage caused by strip mining in the mountains, it needs to be implemented.

The brief contends that there are two things absolutely essential to properly controlling strip mining in Alberta, and neither is now in effect. First, control of reclamation must not be left in the hands of the Mines and Minerals Department since it is incompatible with the goal of increasing mineral production. Secondly, companies must be required to submit for approval complete reclamation plans prior to the commencement of mining operation. The right of entry arbitration act should be eliminated immediately and perhaps strip mining for coal should be abandoned altogether in the mountains.

The brief suggests that the coal bearing areas in the mountain regions of the Province should be separated into two categories of equal size. Mining activities should be permitted to continue, or even increased, in the areas that are currently being exploited, such as mountain passes. Other unspoiled areas should be set aside as reserves in which mining is banned for fifteen years. This would allow us to evaluate the long-term effects of large scale operations in the mining areas and make intelligent decisions with regard to the reserve areas.

S.P.E.C. (SOCIETY FOR POLLUTION AND ENVIRONMENTAL CONTROL)

DR. J. WILLIAM KERR      CALGARY

This brief was identical to that submitted by STOP (SAVE TOMORROW OPPOSE POLLUTION) at the Edmonton public hearings. It is not repeated here.



CALGARY ECO-CENTER SOCIETY

MISS JANE MCGREGOR

CALGARY

The brief recognizes that surface minerals will be exploited but questions whether it is necessary now. Strip mining must be considered in a wider context of the finite nature of our resources and the global pollution which results from their use. The general public, with their insatiable demands for goods and a higher standard of living, are ultimately responsible for the increasing rate of resource exploitation. Strip mining is just the whipping boy, we must look at ourselves as the cause of factor.

The Eco-Center refuses to condemn any segment of society - all people are responsible for abusing their environment. The Provincial government must abandon it's policy of economic growth and population increase since these are the basis for most of mankind's pollution problems.

The brief poses the following questions to the Environment Conservation Authority:

1. When our finite resources run out what energy sources do you predict will be available?
2. Will the sale of our coal be regulated in order to preserve as much as possible for the future?
3. Why do the coal companies encourage population growth?

MR. BABEY

Are you advocating pollution control or population control or both?

MISS MCGREGOR

You have to have both. In fact every person unborn is a potential polluter and every person on this earth right now is a polluter.

WAPITI FISH AND GAME ASSOCIATION

MR. H. E. BAYLY

GRANDE PRAIRIE

Surface mining activities are expected to expand rapidly and will undoubtedly have damaging effects on the environment, even if the best mining methods are used. The Province of Alberta should put an immediate stop to unnecessary environmental damage from strip mining and should begin to repair past mistakes. Reclamation should become an integral part of a mining operation so that mining machinery could be used for reclamation procedures.

Recommendations put forward in the brief are summarized as follows:

1. The Provincial Government should establish standards and reclamation requirements for all surface resources and surface mined areas.
2. The Government should enact and enforce regulations to provide that the cost of reclamation of mine lands be put upon the developers.
3. The Government should enact and enforce regulations to prevent, control or alleviate hidden effects or residue deposits that can in future defile our fresh water streams.
4. The Government should enact and enforce time limits for reclamation; basically reclamation should be done in coordinating with the mining operations.
5. Performance bonds should be demanded of sufficient size as to be effective.
6. Surface mining should be prohibited in areas of major scenic value.
7. Areas mined over in the past should be reclaimed.

LETHBRIDGE FISH AND GAME ASSOCIATION

MR. G. M. PITTMAN

LETHBRIDGE

We feel that the report on mining and exploration operations prepared by the consultants is the most complete, comprehensive and the best report that we have seen, and I think that our association would do no better than to endorse their report wholeheartedly.

Mr. Pittman then read into the record a letter addressed to the Minister of the Alberta Department of the Environment. The letter expressed concern about roads, built by coal companies, the effect on wildlife, and the low royalties received by the Province.

ALBERTA FISH AND GAME ASSOCIATION ZONE 1

BRIEF PREPARED BY MR. TERRY PSALTIS; READ BY MRS. FRANCES SCHULTZ  
LETHBRIDGE

The following recommendations are submitted for study and consideration.

1. Restoration plans should be made available to the Department of Lands and Forests for study and approval prior to the onset of stripping operations.
2. Immediate restoration of areas disturbed during exploration should be carried out.
3. It is recommended that the Government of Alberta develop comprehensive and detailed legislation governing strip mining at the earliest possible date.

The Alberta Fish and Game Association, Zone 1, would like to go on record as not opposed in principle to coal mining or even strip mining. We are however strongly opposed to development of any area on a single purpose basis, without assurance that environmental disturbances would be kept to a minimum. The Association is concerned that without restoration the watershed capacity of the entire area can be affected.

Our observations in the Grande Cache area lead us to believe that several coal mining regulations have been violated.

1. The Coal Mining Regulation Act (Section 113).  
After three years of exploration, no visible restoration work has been attempted, other than to fill some pits where no coal was found.
2. The Forest Act (Section 60).  
The method of road construction is not only wasting timber resources, but is also creating a serious fire hazard.
3. The Public Lands Act, 1966 (Section 49).  
The land surface has been destroyed and no effort has been made to separate and stock pile surface materials to enable later reseedling and restoration.

#### ST. ALBERT AND DISTRICT FISH AND GAME ASSOCIATION

MR. GORDON STRETCH

EDMONTON

Since it is generally accepted that a mountain strip mine destroys four times the actual mine area it is essential that the mines be contained in existing transportation corridors in mountains. There is no justification for disturbing wilderness areas with a high recreation potential. More specifically the following four objectives for legislation to control strip mining were presented:

1. A zoning plan for the eastern slopes of the Rocky Mountains is urgently needed.
2. No permit to strip mine should be issued until cost benefit analysis and public discussion show that the area has no other short or long term potential use of equal value.
3. Environmental damage from the mine site and access roads should be minimized. Since the Eastern Rockies is the source for most of Alberta's water special attention should be given to the prevention of water pollution and siltation in these areas.



4. A reclamation board, composed of environmental experts, should be established to administer legislation. The board should come under the jurisdiction of the Department of the Environment.

In essence the Club supports the philosophy, conceptual framework and principles of the proposed legislation.

DR. TROST

What is the possibility of reclaiming strip mined land to turn it into a recreational area?

MR. STRETCH

Yes, there are places where this can be done. For example, some of the deep pits in the foothills are currently stocked for fishing, and camp sites were built in the area. We have to accept effective reclamation. In the steep slope country it is not possible. I think we have to write off the mine site. We should limit the areas that we are damaging but I don't really think it is possible to effectively reclaim steep slope country.

COMMUNICATIONS EMPLOYEES FISH AND GAME ASSOCIATION

MR. WALTER G. PIDGEON

EDMONTON

In general the brief agrees with the position paper prepared by the Department of the Environment, however it is suggested that the following points be enlarged upon:

1. Strict regulations should be established for particular matter released into water courses.
2. Surface reclamation legislation should be retroactive, if possible prior to 1930.
3. The financial security deposit should fluctuate depending on the percentage of reclamation achieved and it should be sufficient to pay for total reclamation.

ALBERTA FISH AND GAME ASSOCIATION

MR. GORDON PEEL

EDMONTON

All man-made surface disturbances should be considered together. Included in these activities are strip mining, road building, seismic operations, forest industries, cattle grazing, damming for power production and the disposal of overburden from strip mines. It is imperative that overlay maps of the various land surface activities be prepared and considered in developing land use regulations. This would also allow for the proper sequential activity by various resource users in a given area.

It should be the responsibility of all resource users to have qualified environmental specialists on staff who could advise on matters related to environmental damage.

Big game species in the eastern slopes of the Rockies primarily depend for their food supply on areas of grass and aspen which comprise only 10% of the total slope area. This critical 10% must be protected from damage associated with resource development.

Four reports commissioned by the Association were mentioned. They have undertaken to bring to the attention of the Government and public some of the environmental problems which exist as a result of strip mining operations. In some cases they reveal that Alberta Statutes had been violated and only minimum efforts had been made to rectify the problems.

Based on its surveys and studies the Alberta Fish and Game Association makes the following points with regard to strip mining:

1. There are no adequate regulations to cover strip mining in the mountain areas of Alberta.
2. It is impossible to reclaim or even minimize the permanent damage that has been created in some mountain areas of Alberta.
3. Strip mining should not be allowed in any areas that are critical summer and winter range for wildlife and that are impossible to reclaim with any technology yet developed.

4. Strip mining should not be allowed in any areas where the overburden cannot be contained in such a manner to prevent erosion.
5. The overlapping effect of all resource users should be considered in making regulations that affect our environment.
6. An economic survey should be undertaken to evaluate the economic benefits of the coal industry in Alberta.
7. A secondary coking industry should be developed so that the refined product can be exported instead of the raw coal.

DR. TROST

We are conducting a continuing series of hearings on the environmental impact of resource development. Strip mining is being considered first and the others in a subsequent series of hearings. You might wish to advise us how we can move from one set to the other in a way that is helpful to the public.

MR. PEEL

We and another organization, the Alberta Wilderness Association, prepared overlay maps of all existing leases and developments affecting five or six of the industries I mentioned. I believe we can make those available to you, to show you where this overlap is occurring and how little land in the eastern slopes of the Rockies is not under some form of lease exploitation at the present moment.

ALBERTA FISH AND GAME ASSOCIATION, ZONE 3

MR. HAROLD RHODES

RED DEER

The Association has become increasingly concerned that this beautiful virgin mountain country will be ravished and laid waste by the hitherto unscrupulous methods of extracting coal by the stripping procedure. This whole area is extremely important to the well-being of fair numbers of wildlife. Development of strip mining in this area would definitely be a factor in causing further destruction of their

habitat; chemical pollution of rivers and streams and increased erosion and siltation are also the by-products of this physical disturbance. It is a fact that reclamation of mountainous terrain is extremely costly and difficult, therefore, in our opinion any type of development such as strip mining, etc., should be prohibited on the east slopes of the Rockies.

#### RED DEER FISH AND GAME ASSOCIATION

MR. R. H. SCAMMELL

RED DEER

Generally the Association believes that at this point in time the whole problem of strip mining for coal or other minerals in Alberta must be examined. It has been judicially established that the Alberta surface reclamation laws are nothing but a joke; the Association believes that any proposals for new surface reclamation laws must be viewed with some skepticism and some cynicism. The Association is somewhat alarmed that the content of the proposed surface reclamation legislation rather than the more basic question of whether or not strip mining of coal should be permitted at all is being discussed.

It is not generally realized how precarious the position of the City is, but if the flows of the Red Deer River are much more depleted, the future growth and, ultimately, the future existence of this City is at stake. It is expected that open pit mining at the headwaters of the Red Deer River will have distinct and deleterious effects over and above those already present. A major effect will be siltation, disastrous in terms of further reducing the dissolved oxygen levels in the river water and the flows of the water itself.

The Association is unable to endorse a statement in the Consultant's report that indicates that the loss in aesthetic values from surface mining cannot be given any realistic value. The Association submits that it is a failure of science or a paucity of imagination that suggests no realistic value can be put on it.



The proposed legislation appears at the very least to be an improvement over what we have now. The legislation does not make it clear that there may be areas and situations in Alberta where no strip mining shall be carried out, particularly where an impact statement reveals that either the long-range economic costs of the strip mining exceed the short-range benefits, or that the social costs of the strip mining are too great to be justified. The Association submits that a case can be made that no strip mining whatever should be allowed on the immediate watershed of any river servicing large population centres in Alberta.

DR. TROST

You commented on the need for an environmental impact statement and you have described the contrasting situation in the prairies and in the mountains. Do you think that it would be advantageous to have the legislation and the regulations broken into two parts, one effective in the prairies and one in the mountains?

MR. SCAMMELL

Not only are there differences in the applicable procedures of reclamation in the two types of terrain but there are significant differences in the way the mining itself is carried out. To combine everything in one act may cause a situation that would lead to confusion and difficulty for operators and the public.

DR. TROST

Do you think the desirable way is by specific locations or one in which whole areas have to be protected regardless of how the sites may change within areas?

MR. SCAMMELL

In researching the effect on rivers and streams the whole watershed is looked at therefore protection will have to be on the basis of watershed planning. There may be areas where strip mining will not be allowed at all and others where strip mining can be done if very rigid precautions are taken.

MR. BABEY

You suggested that another look should be taken at some of the leases in areas where there are watersheds for some of the rivers. Can you

foresee any legal complications in trying to retrieve the ownership?

MR. SCAMMELL

I am unable to foresee any legal problems as I have not been able to look at some of the leases yet. There might be some problems with regard to compensation or with expropriation. In my view there is ample authority in the great number of Alberta Acts for a Government Cabinet Minister to say "NO".

DICKSON FISH AND GAME ASSOCIATION

MR. H. JENSEN

RED DEER

This Association feels utmost attention should be given to the reviewing of our laws governing the development, use and management of our natural resources to ensure their adequacy and consistency. The overriding power of mining legislation enables coal, mineral, and other exploration in places where this may not necessarily be wise. The Association urged the Environmental Committee to recommend to the Provincial Government to stop exploration of coal, oil and gas in the Rocky Mountain forests before we lose our natural heritage.

LACOMBE FISH AND GAME ASSOCIATION

MR. J. TOWLE

RED DEER

The scars left by strip mining are quite evident throughout the remote areas of our mountain wilderness. This country is wild and beautiful until one looks closely at the disturbed areas. Even scenic locations, such as Mount Rundle, are not left untouched.

Strip mining is probably the most economical way to produce the product so vital to our economy but the anti-pollution and reclamation price should, and must be borne by the production of that product. This

doesn't mean that strip mining must be halted but it means that it must be properly controlled and that strip mining must pay proper attention to the protection of the environment.

BIG GAME AND GUIDE OUTFITTERS

MR. G. E. HODGES AND MR. ED LIGHTFOOT

GRANDE PRAIRIE

The brief contended that while extraction of minerals is necessary for the economy of the country, big game habitat and the environment must be taken into consideration. With proper reclamation procedures, areas strip mined could again be wildlife ranges ten to twenty years after the mining operations have ceased. To prevent over-destruction of game habitat, the brief recommends that not more than five to ten percent of any region above the 5,200 foot level should be strip mined during one restoration period. The use of helicopters should be restricted to the area immediately surrounding the mining operation since they can cause big game to stampede if flown too close to mountain habitats.

DR. TROST

Do you have any more comments that you would like to make with respect to your submission?

MR. HODGES

I would like to see, if you have a coal exploration, that it is kept within the limits of where it should be working, and not all over the whole country. I can show you country we have known for years where I can now drive with a pick-up, what are you going to do?

THE HOOK AND HACKLE CLUB

MR. WILLIAM RUTHERFORD

CALGARY

Surface mining is a much maligned industry, however, the brief contends that if adequate environmental regulations are adopted and enforced it can be among the least offensive surface disturbances.

Several points were made with regard to strip mining or similar activities which caused disturbances to streams, rivers and lakes. They result in pollution, erosion and siltation of streams; physical and ecological damage to water courses; destruction of spawning beds and a deterioration in fish and insect habitats.

The brief recommends the following preventive measures to protect the environment:

1. Adequate buffer zones along streams, rivers and lakes.
2. Proper bridging of streams and rivers.
3. Regulations to minimize the effects of operations on water flows.
4. Complete avoidance of the introduction of any matter whatsoever into water systems.
5. Complete avoidance of any activity that will result in uncontrollable land erosion.



THE INTERNATIONAL UNION OF OPERATING ENGINEERS

MR. IRVIN C. NESSEL

EDMONTON

Alberta is unique with respect to a variety of terrain and the diversity of wildlife species which that entails. It is also a land rich in natural resources. These two blessings may not be incompatible but it is unlikely that one can be improved substantially without altering the other. In order to enjoy an acceptable standard of living we must develop our resources but a balance between the two is necessary.

We must have enforceable land use regulations. An operator should be obliged to submit a comprehensive development plan concerning the mining operation, the ultimate land use and the reclamation program to obtain that use. Wilderness areas are needed and must be assigned in perpetuity. Abandoned mine sites must be reclaimed although some areas (Drumheller Badlands) may not lend themselves to practical reclamation. Since mining operations are seasonal in some areas, people and equipment could be made available for reclamation work on abandoned mine sites, gravel pits, etc. Both industry and Government could use these areas as excellent training grounds for people learning to operate heavy equipment.

DR. TROST

You touched one point that is of considerable interest to the Authority and that is the man-power training needs that might be involved in reclamation matters of all sorts. Would you like to elaborate on that?

MR. NESSEL

There are many programs, schemes, and funds available through the training authorities by industry training and Federal Government schemes, where the Federal Government picks up 75% of the cost on a cost share basis with the Provincial Government. None is available however, to industry for industry training programs whereby people who have the necessary skills and equipment could, during the off season, develop this reclamation training. Existing mining companies should bear that cost and certainly the educational authorities or the adult vocational training people should be looking at some of these areas.

ALBERTA FEDERATION OF LABOUR

MR. EUGENE MITCHELL

CALGARY

Although the environment is the result of numerous changing factors, the changes brought by strip mining can hardly be considered as "natural". Surface mining destroys the protective vegetative cover and leaves the soil and rock in huge piles. The end result is often a drastic re-shaping of the surface accompanied by an alteration of the normal drainage systems. Landslides may occur and water may become polluted.

The brief contends that surface mining effects the quality of air, soil and water, and consequently, animal and plant life. The dust and vibrations associated with surface mining can be major contributors to air pollution. Some of the more obvious problems related to soil disturbance are (1) erosion, (2) impaction, (3) sedimentation, (4) pH changes, (5) disturbance of wildlife habitat and (6) the use of waste material for road construction. Pollution of natural water systems may result from chemicals and minerals, changes in acidity, oil, sedimentation and debris. In addition, surface mining operations give rise to related problems such as fires in abandoned pits, landslides, accumulation of rubbish, diversion of streams and the danger of open pits.

It is the contention of the Federation that the conflict of interests surrounding the use of land for minerals must be resolved in a way which will maximize the utilization of all the province's resources. At the same time the objectionable, economic and social side effects must be minimized; if it is not possible to enhance the value of the mined out area then environmental degradation should be minimized. To this end the following recommendations are made:

- [a] The Government should set standards for reclamation.
- [b] Legislation should be enacted which would ensure that the cost of reclaiming mined lands would not be a financial burden on the public. Such legislation should require reclamation plans from operators and establish performance bonds sufficient to cover the cost of reclamation.

[c] Research findings should be centralized and made available for general use.

Many benefits can be derived from multiple land use. For example, access roads can be used for tourists and fire protection. In this context, previously inaccessible areas may be opened up to meet the Province's ever growing recreation demands and future economic potential may be more readily realized.

UNITED MINE WORKERS OF AMERICA

MR. ALBERT F. PEARCE

CALGARY

The mining industry is important to the economy of the Province and the Union is concerned that a reduction in the growth of underground or surface operations could pose hardships for miners and their families. Nevertheless, miners do not wish to see the environment permanently damaged as a result of their actions.

The brief recognizes the problems of surface mining but contends that underground operations are not an acceptable alternative because of economies of scale and the competition for international markets. It is suggested that surface mining can provide employment as well as satisfy the requirements of environmentalists with adequate reclamation schemes. The reclamation programs may, in fact, provide further employment opportunities.

The brief submits that with proper controls in strip mining the Government can ensure the prosperity of the miners; contribute to the growth of the provincial economy and adequately protect the environment. Curtailment of mining operations in Alberta would be a regressive step with severe consequences on much needed employment.

UNIFARM, REGION 1

MR. MELVIN C. LONGSON

GRANDE PRAIRIE

Rural and urban people of this Province have the need, and appre-

ciate opportunities for relaxation. for those who enjoy the great outdoors and a close association with nature, what could be more rewarding then having the opportunity of visiting and enjoying a wilderness area, unscarred by commercial developments; having the view of snow capped mountains; clear streams and the beautiful Kakwa Falls.

At the Region 1 Unifarm Convention, held in Grande Prairie, June 24, 1971, the resolution was passed indicating support for the Wild Kakwa Association to save the wilderness area.

A letter was forwarded to the Environment Conservation Authority following the Convention and this brief underlines the support indicated in that letter.

DR. TROST

Are you also supporting the concept that Mr. Brackenbury presented to us, that of a restricted area around the wilderness area?

MR. LONGSON

Yes, I think we would support this. I feel that there should be some development in the area not quite adjacent to the falls.

UNIFARM, REGION 14

MR. BILL NICOL

LETHBRIDGE

We realize the fact that energy is playing a vital role in the economy of Canada and Alberta. However, in the area around Lethbridge, we have about 686,000 acres under irrigation, which is competing with the cities for water. If this area were dry land agriculture the revenue would be somewhere in the neighbourhood of 16 million dollars, while at present with irrigation the revenue is about 73 million dollars. We realize that mining operations require removal of overburden but the watersheds are very important to agriculture, not only through irrigation but also for the people in the foothills where there can be run-off from these mining operations.

Because of the winds that we have here, there is cause for a lot of concern about wind erosion in areas where strip mining is started, and for one reason or another, people have left and it hasn't been cleaned



up. Many of these are located fairly close to streams, and a lot of this stuff is running off into rivers and streams and also is affecting livestock production. Another area that I feel should be looked into in the future is gravel. We will have to look at this as another aspect of surface mining and also some regulations will have to be designed for this activity. When we discuss strip mining we should also be concerned about the replacement of top soil. Top soil should be replaced to the best standard in order that this land can be put back into good agricultural use and not affect the surrounding district. Planning should be looked at over longer periods of time than just the immediate generation, because of what we believe for future generations.

DR. TROST

Do you have information as to whether land now under irrigation has coal that can be extracted by strip mining techniques?

MR. NICOL

In some areas it can. There have been two or three operations just north of Letnbridge and in the Taber area where there is some irrigation. These are located off the flat portion of land and more along the rivers at the present time.

UNIFARM

MR. R.J. PAGE

CALGARY

Unifarm recognizes that resource development is a major part of the provincial economy, but urges that agricultural, hydrological, recreational and aesthetic values must not be sacrificed in the interests of such development. The brief places strong emphasis on the need for a complete form of reclamation which takes into account the needs of rural communities.

Surface mining in the plains area displaces farmers and ranchers and tends to impoverish the communities effected. The economic benefits often associated with mining operations tend to be short term and cannot be compared with a long term contribution to the community made by agriculture.



Mining also effects the nature of the soil itself. In areas of light soil, where the ecological balance is delicate, there are likely to be serious problems of erosion before plant life can restore stability. The biological nature of the top soil is also subject to change.

In the future a considerable amount of land might be removed from agricultural production for surface mining. At the same time increasing demands for food from many parts of the world will likely result in fertile land becoming a more precious resource than it appears today. Careful planning is needed to ensure that land reclaimed from strip mining is returned to individual farm producers.

Recommendations presented in the brief are summarized as follows:

1. Surface mining should be discouraged in areas where successful reclamation cannot be guaranteed or the long term future of a local community is threatened.
2. Reclamation of surface mines on the prairies be designed to make the land available for agricultural production in the shortest time possible.
3. Regulations of surface mining operations should take into account regional differences in ecology, types of soil and land use.
4. Land owners should have the option of selling land, or leasing it to coal or other producers with adequate assurance of successful reclamation.
5. Land reclaimed from strip mining should be offered for sale at current market prices within a given period of time following reclamation.
6. Removal, storage and replacement of top soil and overburden should be carried out in a manner to ensure a minimum damage to water resources.
7. In cases of expropriation for purposes of surface mining, compensation should take into account the economic affect of reduction of the size of the effected farm unit.
8. In the interests of preserving unspoiled areas of natural beauty for recreation purposes, recreation corridors with reasonable access should be established. Specifically, a natural recreation corridor is recommended along highway

11, starting 30 miles west of Rocky Mountain House and continuing to the Banff National Park boundary.

9. No exploration or mining should be permitted within a seven mile radius of any exceptionally scenic spot or educational or recreational facility already established.

DR. TROST

Your submission brought up the impact of surface mining on rural communities. You are implying that if farms are taken out of production by improper or insufficient reclamation then there is a gradual decrease in the livelihood and the resources of that particular area. Would you like to elaborate?

MR. PAGE

Yes. This is one of our concerns. Take an economic unit, a farm of 640 acres, and unknown to the farmer there is coal under this land. They would come along and they would want this to be developed. Probably he didn't want to give it up, maybe the land would have to be expropriated. He may then lose a half section or 200 acres or something. He would then no longer have an economic unit and this would make him leave that farm or sell what he had left to somebody else.

MR. BABEY

In terms of long-term productivity of the soil, is it your view that the soil can be restored to its original productive capacity at a fairly rapid rate?

MR. PAGE

This depends on the ecology of the soil. In some areas it can be brought back fairly quickly, in other areas it cannot. We do have areas of very thin top soil and once this is disturbed it is very hard to bring that back into production. Where we have heavier soils and more top soil, you can bring that back into production more quickly.

LIBERAL PARTY IN ALBERTA

MR. A.S. ROMANCHUK

GRANDE PRAIRIE

The Liberal Party in Alberta endorsed the principle of conserva-

tion and preservation of the environment for the benefit of present and future Albertans. The brief suggested that the Government implement a new Land Use Act, applicable to the entire Province, which would deal with the preservation of land as well as reclamation proposals and procedures.

Specifically, the new Act:

- [a] Would be administered by the Department of the Environment.
- [b] Would set up a new Council replacing the Surface Reclamation Council.
- [c] Would apply to all coal, oil and exploration companies.
- [d] Would require that before any mining or exploration permit is granted the operator must file a blueprint of development showing:
  - i. Cost benefit analysis of the development.
  - ii. The land use objectives.
  - iii. A scheme of reclamation and the cost thereof.
- [e] Would set out that all costs of reclamation are part of the cost of the operation.
- [f] Would specifically exclude from any economic activity all areas in Alberta designated as wilderness under the Wilderness Areas Act.
- [g] Would allow the Council to appoint an inspection branch.
- [h] Would set out that no new strip mining permits be issued without proper advertising and public hearings.
- [i] Would set out that every operator furnish a bond for reclamation in a sum equal to the estimated cost of reclamation of the project.
- [j] Would set out severe penalties for non-compliance with any of the provisions of the Act.

EDMONTON CHAMBER OF COMMERCE

MR. E.K. CUMMING

EDMONTON

The brief submits that land utilization should be decided on the

basis of a maximum benefit to all Albertans and Canadians. Several techniques are available for reclamation and the following points should be considered for inclusion in the proposed Act:

- [a] The degree of reclamation required for specific mining operations should take into account the geographic location of the site.
- [b] There should be provision for adequate time lapse to reclaim the area.
- [c] Where legislative controls are unnecessary, industry should be informed of reclamation requirements prior to the commencement of operations.
- [d] The Chamber recommends combined research of Government and private enterprise on methods of reclamation.

DR. SMITH

You state in your brief that the land utilization should be decided on the basis of maximum benefit to Albertans and Canadians. Would you care to expand on that?

MR. CUMMING

We believe that all decisions should be made on the basis of cost benefits and that we should obtain the maximum benefit. We believe that there is a need for objectivity in determining benefits and that the benefits should be carefully measured on an economic basis. We believe that it is possible to quantify environmental benefits, recreational benefits, and also to quantify the disadvantages if any.

THE WIGHTON FAMILY

MISS CARLA WIGHTON

EDMONTON

The brief contends that the Provincial Government should consider the introduction of "user fees" for materials removed from the environment. For each material the fees would be set equal to the social cost to the environment if the material were eventually returned to the environment in the most harmful way possible.



Some long-range policy decisions are required with regard to the future plans for Alberta when non-renewable resources have been depleted and the Canadian responsibility for assisting other industrialized countries by supplying their raw energy demands.

The possible extraction of Alberta coal should be carried out in an orderly and strictly controlled form and to this end the following suggestions are made:

1. No extraction take place under any conditions on or around mountains.
2. Under no conditions coal extraction take place in Provincial and National Parks.
3. Approved deep mining allowable in selected locations of the foothills area with severe reclamation regulations enforced.
4. Approved strip mining operations be allowed in the plains region with severe reclamation regulations enforced.
5. Absolutely no mining operations be permitted within one kilometer of any watershed.
6. We suggest that a suitable fund for financing reclamation, research and operations be set up from mining company posted bonds.

Mining and reclamation should be supervised by qualified Provincial Government staff and the legal aspects of violations should be the responsibility of the Attorney General's Department. Heavy equipment should not be used for prospecting and construction of roads and transportation routes should be part of a total mining and reclamation plan submitted to public hearings before operations commence. It is pointed out that reclamation procedures could provide substantial job opportunities for Albertans.

ALBERTA GEOGRAPHICAL SOCIETY

MR. RONALD WISTANCE-SMITH

EDMONTON

The Alberta Geographical Society is in favour of resources being developed for the greatest economic benefit, but these benefits must include preservation of the environment. The brief focuses on the locational aspects of future strip mining operations since the success of reclamation depends largely on the characteristics of the area.

The foothills-mountains region is characterized by high relief, high annual precipitation, intense rainfalls and, consequently, a maximum erosion potential. The top soil is minimal and the vegetation, particularly at the higher elevations, is very fragile and next to impossible to re-establish. These factors give rise to reclamation difficulties. Certainly this area presents the greatest mining problems and the least possibility for adequate reclamation. Furthermore, competition for alternate land uses, particularly recreation, is greatest in this area.

Contrasted with the foothills-mountains area, there are fewer problems associated with strip mining in the plains area and the possibilities for successful reclamation are greater. The plains area has less potential for recreational use and therefore strip mining has a higher priority.

The brief strongly urges that the Government of Alberta instigate a plan for the Province in which all areas of potential surface mining are identified, zones established with priorities for development and means established for discouraging or barring development in areas of low potential for minerals or of high aesthetic value. Any changes in zoning for development would result only after public petition and hearings.

In developing such a plan, pre-determined areas of mineral value should be ranked according to commercial potential, possible environmental damage and priority for economic expansion. The Environment Conservation Authority should establish a sliding scale of performance bond values based on the estimated cost of reclamation and alternate land uses for specific areas.

RATEPAYERS OF HARVIE HEIGHTS - COMMITTEE ON RUNDLE MOUNTAIN STRIP MINE

MR. NEIL V. STORY

CALGARY

The Committee's report contained (1) a summary of a meeting with Canmore Mines Limited; (2) minutes of a meeting with Canmore Mines Limited; (3) comments by the Committee; (4) an extract from a letter from the Minister of Lands and Forests; (5) a copy of a letter from Canmore Mines Limited; (6) recommendations by the strip mine committee. Item (1) provides background information on the topic and Item (6) adequately presents the position and feelings of the committee with regard to the operation of Canmore Mines on Rundle Mountain. These two items are summarized as follows:

A) A Summary of a Meeting between the Committee and Canmore Mines Limited

1. Canmore Mines Limited states that it must produce in excess of 400,000 tons of coal per year or shut down its operation. It currently produces 250,000 tons of anthracite coal from its underground mines at Canmore and intends to augment this production by strip mining coking coal from the area on Rundle Mountain presently cleared and known as Walker No. 1.
2. Canmore Mines intends to:
  - a) Recover approximately 200,000 tons of coking coal from Walker No. 1.
  - b) Cut access roads and cuts and carry out drilling programs on its other land in the area.
  - c) Make application for permission to strip mine additional coking coal on its lands wherever drilling results indicate it is economical to strip mine.
3. Canmore Mines stated that the maximum area to be cleared on Walker No. 1 would be approximately 35 acres.
4. A water filter system will be constructed to clear water which enters the strip mine and becomes contaminated with coal and soil.

5. Canmore Mines expects Walker No. 1, and other strip mines, to take approximately two years from commencement to reclamation.
6. Canmore Mines expects to employ about 28 men on strip mining, some of which may not be local people. The company directly employs a total of 300 people; 200 more in Canmore are dependent upon the total mining operation and possibly a further 1,000 Canadians are employed as a result of Canmore Mines operation in this country.
7. Canmore Mines has stated its sincerity and intent in complying with Government operational and reclamational requirements.
8. Canmore Mines is having a land development study carried out by a Calgary consultant.

B) Recommendations of Strip Mine Committee

It is recommended that the ratepayers of the Harvie Heights and Bow Valley Subdivisions:

1. Submit a written request to the Environment Conservation Authority and/or other Alberta Government Departments having jurisdiction thereto, asking that public hearings be held on any application by Canmore Mines Limited to carry out further strip mining operations on Rundle Mountain than that are presently underway.
2. Submit a written request to Canmore Mines that any further developments of strip mining on Rundle Mountain be carried out to conceal as much of the spoil heaps as possible, using a "line of sight" from the top road in Harvie Heights and not from the Trans Canada Highway.
3. Submit a written request to the local M.L.A. and the Alberta Government requesting that it be kept informed of any developments which might effect the taxes, environment and ecology of the sub-divisions or the life of the ratepayers.
4. Submit a written request to Canmore Mines asking that the ratepayers be kept informed of the plans for the development of strip mining on Rundle Mountain.



5. Maintain a committee of four to six people to investigate and report to the ratepayers on the strip mine and any other development which is likely to affect the ratepayers.
6. Acknowledge the courtesy and time given to the strip mining Committee by Canmore Mines.

DR. TROST

In your own judgment, can the welfare of the town and the welfare of the valley be satisfied?

MR. STORY

I don't know the answer to that. I feel that in a relatively small size mine that is being operated with a high quality of initial reclamation, that one strip mine might be reclaimed satisfactorily so that it would fit in with the profitability of the mine and also with the local residents. I believe that the Canmore Corridor would be developed as a people area, accomodation will be required and I believe the present strip mine may be beneficial to this purpose, but when I multiply that by six miles or the length of the corridor, it is just more than I know the answer to, it is just more than I can visualize, ruining that valley.

ARCHAEOLOGICAL SOCIETY OF ALBERTA (CALGARY CENTRE)

MR. D.B. COUTTS

CALGARY

Alberta is rich in historical and prehistoric remains but these are rapidly being lost. The Society is campaigning for the chance to survey and salvage possible sites before they are destroyed, and the opportunity to preserve those sites of special importance. The Kananaskas Valley, Banff - Bow River Area and Mount Rundle are sited as areas which are threatened or of considerable archaeological and historical importance.

Since the salvage operations and surveys must be conducted as soon as possible in the development of a mining operation, it is suggested that such activity be included in the requirements of a work permit.

The foothills and mountain areas are more important than a plain since the terrain concentrates the usable land and therefore the activi-

ties. All aspects of a mining operation (quarry, roads, campsites, etc.) could have a major impact on archaeological and historical resources in areas of restricted accessibility because:

- 1) Archaeological sites probably occur in similar locations.
- 2) Ancient trails likely follow the same routes as present day roads.
- 3) Increased erosion from mining operations often destroys sites in proximity to water courses.

The tourist potential of historic and archaeological sites should be taken into account as much as the cultural value when considering the costs of strip mining. Professional archaeologists and historians are available to assist in the implementation of the above proposals.

#### THE ALBERTA ECONOMIC DEVELOPMENT AND PRODUCTIVITY COUNCIL

MR. COLIN M. MITCHELL

CALGARY

Strip mining is a modern technique originally based more on economic or financial considerations than on acceptable mining practices. The methods used in these mining operations are, in many cases, destructive to the environment for purely pecuniary reasons.

The Appalachian region of the United States was subjected to all the mistakes and oversights associated with the evolution of strip mining. The rich coal deposits of this area were the basis for a wealthy industrial nation; however, its development brought about many conditions that were undesirable in a practical, social and aesthetic sense.

Many lessons have been learned and some of the corrective measures are already in effect in Alberta. Nevertheless, there are some basic differences between Alberta and the Appalachian region which must be recognized in developing regulations for our provinces' strip mines. For example, eastern coal contains relatively large amounts of sulphur which results in severe water pollution from sulphuric acid. Alberta coals tend to be low in sulphur content and acid pollution is not recognized as a significant problem. Modern strip mining methods tend to be custom designed to the structure to be mined and, therefore, practices such as contouring and

surface reclamation procedures should not be adapted from another region without realistic and knowledgeable analysis.

As a contribution to the decision making process, the brief poses the following questions to the Environment Conservation Authority:

1. What specific problems of this region have prompted the public hearings?
2. How does the Authority see this systematic analysis of these presentations as being helpful?
3. How will the presentations be used and what form will the results take?
4. Who will benefit and who will pay for the suggested changes?

DR. TROST

Is it your view that a system of reclamation and watershed protection can be carried out concurrently with sensible strip mining operations?

MR. MITCHELL

Yes. The only qualification I would put to that is that there is a very wide range of reclamation costs and these may not be compatible with the marketing conditions for any given area of coal development or mining development.

DR. SMITH

Did you infer that reclamation or protection of the environment in general could be carried out under the present laws as exist in this province?

MR. MITCHELL

Some of the mining operations are doing this and to my knowledge, they are doing it to the satisfaction of the mining authorities.

MR. BABEY

Who should bear the cost of reclamation?

MR. MITCHELL

I would hope that reclamation would be part of the final cost of the product.

# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA

SUBMISSIONS FROM  
INDIVIDUALS

ENVIRONMENT CONSERVATION  
AUTHORITY





MR. WILLIAM MICHALSKY

LETHBRIDGE

I do not approve of any surface mining particularly in our mountain country. I wish mainly to indicate my concern and awareness of the complete desecration and loss by coal mining of hundreds of acres of beneficial grass lands. Almost no vegetation covers the old coal slack heaps of even the earliest mining in the Crowsnest Pass. The export of coal is of small benefit to this Province other than to provide temporary employment for a few miners.

All land disturbed by surface mining directly or indirectly, past and future, must be reclaimed. There may be some method of removing, preserving and later replacing the sod of new mining sites. It appears impossible for the original type of native grass to restore itself except on a very small area.

Government legislation should require stripped land to be reclaimed without delay, but the time limit should be sufficient to ensure a good quality job.

MR. EDWARD DAVIDSON

LETHBRIDGE

I have been closely associated with the area under consideration, mainly in the area from the Crowsnest Pass, north of the We have observed the natural condition and changes due to mining, lumbering, oil industry, road construction, and recreation and hunting pressure. The area which has been referred to today north of Blairmore about six miles was one of the finest grazing areas in the whole allotment of the forest reserves. Since the mid-1960's that area has been abandoned and Grassy Mountain has been completely desecrated, with huge black seams and holes exposed. I wish to support some of the things that have been said about strip mining and what it has done to this mountain. An example is on Racehorse Creek on the north side of Tent Mountain, where mining operations established a new mine entrance. The mine entrance is very close to the south bend of Racehorse Creek. The side of the mountain slid down over the mine entrance to the creek and I can testify that Racehorse Creek now runs dirty a great deal of the summer as well. I would like to state

also that the road from Coleman up the Kananaskis road, eleven miles to where the first turn-off occurs to one of the first mine entrances, is the most hazardous piece of road because of the coal dust created by trucks with a capacity of 28 to 60 tons. During July and August, when it is dry, it is impossible to see anything and there is no way that any tourist could even drive up that road.

Irrespective of what coal companies say, they have made no effort until public pressure was brought upon them in recent years, to do anything about reclamation. Corporate production has to be then within a reasonable utilization of the resort and in consideration of the future. I would like to support Mr. Hammond by stating that the tourist and recreational values so far outweigh the value of coal development that there is no comparison.

MR. AL. JAMES      EDMONTON

The brief is primarily concerned with environmental damage resulting from coal strip mining operations in the Coal Branch area of west central Alberta. Reclamation in this area has not been adequate. Since no system has been developed to determine reclamation costs it is not possible to calculate the price of a ton of coal. The concept of jobs at the expense of the environment should be critically evaluated.

It is not sufficient to allow pollution of a watershed simply because it ultimately drains to the arctic and affects relatively few people. Development of a recreation industry in the area should be given serious consideration both for aesthetic as well as monetary reasons. The specific area suggested for such a development is bordered by the Cardinal River Divide, Jasper Park Boundary and the Brazeau River.

MESSRS. P.H. BOUTHILLIER and W.L. BIGG      EDMONTON

Environmental legislation with regard to strip mining must be designed to prevent pollution of lakes and streams and minimize aesthetic damage to the landscape.

Suggested operational restrictions are summarised as follows:

1. Waste dumps or storage piles should be designed to prevent run-off into water courses.
2. If mining waste cannot be replaced in the area from which it was removed then appropriate landscaping shall be undertaken.
3. The government should require that the operator submit an operational plan, with legal status, for all aspects of the mining operation before production begins.
4. A charge of 10¢ per ton of coal produced should be collected by the government. This money would be returned to the operator if the results of pollution control and reclamation procedures were satisfactory to the government.
5. The government should set specifications but the onus should be on the operator to provide a workable plan for the prevention of pollution.

MS. MIECZYSLAWA GAWLAK

EDMONTON

The author recognizes the importance and necessity of resources, including coal, not only for Alberta but for the world in general. However, resource utilization must not lead to environmental degradation; reclamation costs must be an integral part of the extraction costs.

The standards for strip mine reclamation set in Alberta should be high, as an indication of the importance which we attach to other resources such as clean air, clean water and aesthetic pleasing landscape. Strip mining should be banned in areas which cannot be effectively reclaimed or are of particular ecological or aesthetic importance. A no-disturbance safety margin must be created around all streams and lakes to prevent siltation.

Adequate legislation is urgently required to prevent future environmental damage from the construction of access roads, camp sites and excavation areas associated with mining practices.

The land area directly disturbed by strip mining is a misleading figure since it does not take into account the associated environmental damage such as water pollution, disturbance of wildlife or their habitat

or the aesthetic damage. More important is the fact that of 35,000 acres disturbed by strip mining in Canada by 1969, only 2,000 have been reclaimed. There is evidence of a new industrial consciousness with respect to the environment which will hopefully lead to their support of protective legislation.

MR. CHARLES LACY

EDMONTON

### Introduction

Alberta is well known for its big horn sheep rams; non-residents spend about \$5,000.00 for each ram taken. There are an estimated 4,000 of these animals outside of the national parks, a relatively small number compared with other wildlife species.

### Winter Ranges

Big horn sheep numbers are limited by their very restricted winter ranges which are generally of two types. The first is a wind-swept, west facing slope on which the sheep locate isolated exposed patches of vegetation. The second type, which generally supports larger numbers of sheep, is a south facing slope which is kept clear of snow by wind and sun. Sheep are not well adapted to survival in deep snow and these ranges are important to their winter survival. There are approximately 70 winter ranges along the entire eastern slopes of Alberta with an aggregate area of less than 200 square miles. There are six areas, Coleman, Highwood, Canmore, Nordegg, Luscar and Smoky River, where there may exist present and potential conflict between coal interests and big horn sheep winter ranges.

### Conclusion

The brief urges that, where overlap has occurred between coal interests and alpine winter ranges, the Department of the Environment should require operators to use underground mining techniques. If this is not possible then these areas should be bought back or expropriated and mining operations should be banned.



MR. WOLFGANG M. SCHULTZ

EDMONTON

Strip mining has the potential to utterly destroy the environment but if adequately controlled it can be a safe, efficient operation with minimal environmental damage. Operators must realize that they no longer have the right to desecrate the environment in the name of exploitation; they have responsibilities to fulfill in return for the privilege of extracting a resource.

In the final analysis, it is the mores, values and laws of society which make a free enterprise system work. Property rights and the right to use and enjoy resources have always received exceptionally good legal protection. While the present laws with regard to these rights recognize the long standing violations such as stealing, noise and nuisance, they fail to recognize some of the more novel environmental infringements such as mine wastes, sulphur dioxide, nitrous oxide, etc.

When the first coal mines opened in Alberta it might have been quite appropriate for the Provincial Government to collect royalties of 10¢ per ton. Today however, the productivity of a miner in an open pit mine is perhaps 1,000 tons a day and most of the equipment used in the business comes from outside of Alberta. These facts, along with the Government investment in transportation routes to coal fields, inflation and the world energy outlook, suggests that coal royalties should greatly increase - perhaps to \$10.00 per ton for top grade coking coal.

Charges for the use of land for strip mining should not necessarily be based on the value of land in terms of farming, timber production, recreation, etc. In addition to setting minimum standards of operation, the Government could put the onus for reclamation on the operator by charging a rent for disturbed land from the time it is stripped of vegetation until it is revegetated to acceptable standards. Rents of \$100.00 per acre per year and up should be considered.

An additional incentive to speedy reclamation may be provided by graduating the rights, increasing them by a certain percentage every year in order to provide a stimulus to use as little land as possible in current operation, and speed up the process of reclamation. While such pricing programs may help to alleviate environmental damage, they should not replace the more direct protective measures such as clearly defined minimum stand-

ards and adequate enforcement.

The brief contends that there is a pressing need for an efficient, organized administrative structure to enforce mining regulations and reclamation standards. It also notes that operating standards should assist the mine operator to do what is required as efficiently as possible.

Some additional comments presented in the brief are summarized as follows:

1. A mine operator could rightly expect to have the conditions of his license spelled out in advance. But he cannot expect to be absolved from his liability for material adverse effects which were unforeseen or could not be predicted.
2. The experiences and regulations applying to coal mines should also be applied to the oil sands which are going to be mined in open pit fashion.
3. More research money must be devoted to social and biological problems.

MR. A.L. HARRIS

CALGARY

It is imperative that the general public and the provincial government realize the recreational potential of the forest reserves on the eastern slopes of the Rocky Mountains. These areas hold the key to the recreational demands of the major urban centres of Calgary, Lethbridge, Red Deer and Edmonton.

There is a need to conduct cost benefit analyses, other than those undertaken by industry, of all major resource developments (e.g., Big Horn Dam). It is possible to measure the benefits to be derived from recreation, as well as the costs involved in an alternative resource development. For example, an American hunter or fisherman in Alberta may inject directly or indirectly \$100.00 per day into the Provincial economy. By the same token, it may be logical to argue that a day in the forest areas may be worth a hundred dollars to an Albertan. On this basis, a million tons of coal, at royalties of 10¢ per ton, is only equivalent to 1,000 Albertans enjoying the mountains for one weekend!

Although yearly strip mine operations may be relatively insignificant, the total area affected in ten years could permanently scar Mount Rundle. Based on the results from ski slopes, it could be 25 to 30 years before trees are established on reclaimed areas; and a much longer period before mature forest cover is restored. Is this really what we mean by reclamation?

Unless the companies can guarantee adequate environmental restoration following strip mining operations, the province should consider phasing out the operations on Mount Rundle and relocating the workers over the life-span of the present mine. The brief contends that past reclamation procedures practised by the company were inadequate and future success will only come with strict government control.

It was suggested that no expansion of strip mining operations be allowed in the province and that companies which have incurred exploration costs should be compensated by the government.

Emphasis was placed on the need for legislation which would allow the individual the right to sue for environmental damage other than that which affected his personal property or health.

Mining companies cannot justify their actions by comparing the extent of their operations with the amount of land being utilized by growing urban centres. Two wrongs don't make a right. Any practise which does not take account of the relationship between nature and people may be morally and economically unsound.

DR. TROST

On what grounds are you suggesting the right of the individual to sue be established? On his own right if he is damaged in his personal property rights, or on behalf of the crown as a general citizen?

MR. HARRIS

No. I think as a general citizen.

DR. TROST

Most of your comments have been directed toward mining in the forest areas, the foothills, and the mountains. Do your remarks also apply to mining in the prairie areas?

MR. HARRIS

The prairie areas are less of a problem except when you get to very sensitive

country like near Medicine Hat where the army camp is.

MR. BABEY

You mention that the individual hasn't got property rights in a stream or river with respect to fishing. Recently I read an article about a group that initiated action on the question of air pollution and I don't think that they have property rights to this either.

MR. HARRIS

They had a class action where they had injury to themselves and they had a right. In class action where you have injury to the parties involved in a way of physical injury, that's just for the gas plant that's down there to the south of the province.

MR. BABEY

Yes, but I was thinking there is a difference if you're intending to sue a government or a company.

MR. HARRIS

If you can show an injury to you, a form of physical injury, you can sue as a private individual of course.

MR. NEIL STORY

CALGARY

The author of the brief made his submission as a Canadian and as a resident of Harvie Heights (near Canmore, Alberta). It was based on information contained in a report prepared by the Committee on Rundle Strip Mine and presented to the Environment Conservation Authority on behalf of the rate payers of Harvie Heights in Bow Valley subdivision.

The breif urges the Authority to determine the following:

- a) Must Rundle Mountain be sacrificed to save Canmore?
- b) Are the economics of strip mining in the area, as presented by the Company, accurate?
- c) What will be the effect on Canmore if strip mining within the view of the public is stopped?
- d) Is a tax subsidy an alternative to stripping the Canmore corridor?
- e) Is Canmore Mines Limited currently a profitable operation?
- f) What effect will increased coal royalties have on Manmore Mines Limited?



- g) Could another coal bearing area be substituted for the Rundle Mountain deposits?

The brief urges that in the future public hearings be held on all proposed strip mines before any development takes place. Sepecifically it requested that further extensions of the strip mine on Mount Rundle be designed to minimize the public view of the operations from Harvie Heights as well as the Trans Canada Highway.

ROBERT CLIVE BROWN AND FRANK BROWN

PRESENTED BY MR. JOHN STEIN      CALGARY

The brief is concerned with the conflict which arises when one natural resource is being extracted and another is being destroyed in the process. In particular, it contends that the coal strip mining operation carried out by Calgary Power Limited at Wabamun is resulting in a substantial reduction in quantity and quality of sand and gravel found at the mine site. Sand and gravel is contaminated with coal dust or clay during the stockpiling process or later on during the hauling operations. In some cases the cost of removing these contaminants to make the products marketable is prohibit

There is a concern that the stockpiled sand and gravel, rendered unfit for sale as a result of the contaminants, will remain as unsightly windrows for years to come. The brief does not agree that Calgary Power Limited is doing a satisfactory surface reclamation job in the area. Rather than returning the land to a near approximation of its original configuration, the Comapny has developed a series of hills and ravines which is not acceptable to the surface owner.

A deep concern was expressed over the inadequacy of present legislation which allows a utility company to move on to private land, destroy the surface while extracting one resource (coal), render other resources unfit for use (sand and gravel), and not be required to pay any compensation to the surface owners until after the operation has been completed.

DR. TROST

You are obviously touching on a matter of considerable importance; a conflict of uses and resource development. Who owns the surface rights in this case?

MR. STEIN

In this case there is a combination. The Brown's own 1/3 of the 3,000 acres. They own the surface and gravel rights under the existing law. In the other cases, they have leased the gravel rights from other surface owners.

DR. TROST

Is the sand and gravel that is being stockpiled for Brown and Brown in peril while it is stockpiled?

MR. STEIN

Yes. The two points that they make are:

1. Because of the large scale operations that are being carried out in order to strip the overburden and then recover the coal, they cannot recover the percentage of gravel and sand which they would otherwise recover by the methods of sand and gravel operators.
2. It is piled where coal dust is flung from the bucket as it loads the truck. Trucks drive through the piles of stockpiled gravel and the coal dust gets into these piles.

MR. N. KVISLE

RED DEER

There are three important coal horizons in Alberta: the youngest is the Edmonton formation which is used as a fuel in the thermal electric plants, it yields up to 10,000 B.T.U. of heat per pound; the Belly River grades from lignite to bituminous and yields up to 11,000 B.T.U. per pound; the best coal in Alberta, however, is found along the east side of the Rocky Mountains, grading from bituminous to anthracite, and yields up to 14,000 B.T.U. per pound. The coal in Alberta, 13% of the world's total, represents fabulous wealth.

The management of natural resources, renewable and non-renewable, is the responsibility of the Provincial Government, and therefore the responsibility of the people of Alberta. Our renewable natural resources

must always be more important to us than the non-renewable variety. The multiple use principle is going to be applied to this territory whether we like it or not. Forests are going to be put on a sustained yield 85 year cycle, and mineral deposits are going to be utilized. What we must ask is that first priority be given to recreational use; tourism alone should bring in thirty million dollars a year.

There is a theory that is well know to biologists, but which has not been made known to the public: nature in the raw does not provide the best habitat for wildlife; the habitat can be improved by proper management. By reclaiming the land and growing more plants of the right kind more game animals can be supported. The food supply for fish can be increased by the creation of small lakes in our wilderness areas. Such lakes would transform our wilderness into the greatest in the world.

MR. D.A. BEECHINOR      RED DEER

Mr. Beechinor presented at the hearing an article written by John Schmidt in the Calgary Herald, August 10th, 1965. The article referred to the fact that in 1955 an oil company had come into the area in which Mr. Beechinor lived and had leased the mineral rights on the NE-1/4 of his farm. A producing well came in and flowed until 1963. The reclamation carreid out by the oil company was not satisfactory as there was considerable crude parafin wax left on the ground, the weeds had not been cut, and the fence which the crew constructed was very weak.

MR. R.F. McBRIDE      RED DEER

In the last twenty-five years we, on this continent, have used more energy than was used in the whole world in all previous history, and, if our present rate of increase in productivity is to be continued, we will require seven or eight times that amount of energy by the end of this century. The vast majority of people will continue to seek improvement in their lot, making greater and greater demands on their environment to provide them with the energy necessary to fulfill their desires. Where will

this increased energy come from? Of all the numerous possible ways of supplying this energy, only surface mining can be expanded rapidly enough to fill the demand.

Reclamation requires time, demanding instant reclamation is like demanding a meal without dirty dishes. The time span required to reclaim the land will be dependent upon the geographical location, however, successfully reclaimed land loses its identity as mine land and does not attract attention. Whatever form of reclamation is done we must realize that we cannot please everyone.

There is no doubt that governments must insist on adequate reclamation, but any regulations must be flexible. Priorities must be established if we are to build a better world through the use of cheap and abundant energy. The surface mining industry will play an essential part in building this better world.

DR. TROST

Is it your judgement that the level of technology is now available to make reclamation a feasible operation on the prairies?

MR. McBRIDE

I believe it is, but I believe we will have to take a close look at such items as levelling. Levelling costs about \$400.00 an acre. Return of surface material with less levelling may actually achieve much better growth and in my mind, at a much lower cost to society.

DR. TROST

Do you think it is feasible or desirable to restore land that once was good farm land back to its original condition?

MR. McBRIDE

I don't believe that with the clay materials we have this will prove practical. In the spoiled areas that we have there are about five acres that are now producing more grass than produced on the best farm land in that area.

DR. TROST

Do you feel that reclamation is feasible in the foothills and mountains?

MR. McBRIDE

Yes, there are many areas in the eastern United States that are just as rocky and rough as they are here in the mountains and these areas have been successfully reclaimed.



MR. HENRY LEMBICZ      RED DEER

The brief discussed strip mining in general and offered some suggestions. In the prairies and parkland first the reason and the need must be assessed. As wildlife habitat is vanishing fast, it is suggested that most of the reclamation projects be set up as wildlife habitat. There are many ways in which this may be done. Strip mining in the foothills or mountainous areas is a different story. There are many more liabilities attached to this area. All of the upheaval accompanied by the noise of machinery and man and man's intrusion discourages wildlife, which will abandon the area.

After estimating the liabilities against possible assets, the author does not believe that there are many strip mining operations that would qualify for operation at this time, especially in the forest reserves, and on the eastern slopes of the Rockies. All possible effects of strip mining must be taken into account before a decision is made to begin the operation, then there should be strict regulations with respect to the mining.

MR. E. KURE      RED DEER

The brief deals with the use of mountain areas by any large scale mining operation. Mining operations can cause irreparable damage to the environment by pollution and destruction of the natural values of surface disturbance. It must be made apparent that reclamation of most mountain areas is in fact impossible. Some areas should be developed for oil instead of coal. An oil well can be drilled in a short time by very few people using existing roads and then leaving while a mine in fact becomes a settlement of people and noisy machines. It is suggested that certain mountain areas be zoned to restrict development and particularly prohibit mining west of the first range other than in established travel corridors.

# THE IMPACT ON THE ENVIRONMENT OF SURFACE MINING IN ALBERTA

**SUPPLEMENTARY SUBMISSIONS**

**ENVIRONMENT CONSERVATION  
AUTHORITY**



MR. E. W. STUTCHBURY, Q.C.

Mr. Stuchbury submitted a letter containing some thoughts on mining in Alberta. He pointed out that Justice G. O'Connor back in 1952 implied that, with respect to the Sand and Gravel Act, where recovery comes from farming lands so as to make them unfit for cultivation, then the farmer owner should in effect own what is under the lands. Mr. Stuchbury asked if there is anything which differentiates cultivated or arable lands with relation to sand and gravel from the same proposition in recovery of strip coal, or oil sands covered with arable soil?

D. A. HACKBARTH, Ph.D.

There are two important points missing from both the "Prospectus" and the pending draft legislation presented by the Conservation and Utilization Committee:

1. There is no provision made for any type of "environmental impact statement" relating to strip mining.
2. There is generally quite a lack of quantitative information on the environmental effects of strip mining. It is a little unrealistic to require reclamation without establishing the state to which an area must be returned.

MR. C. R. CHANDLESS

Mr. Chandless submitted a short brief which outlined some of his views. He felt that the impact of surface mining in the foothills will be considerable: it is almost impossible to reclaim these areas; the watershed will be damaged; animal habitats will be destroyed. Mr. Chandless felt that people would benefit more from the countryside as it is now.

ALBERTA FISH AND GAME ASSOCIATION. MEDICINE HAT, ALBERTA.

MR. E. E. SCOVILLE

It is obvious that the mining industry is necessary; we should not stop all exploration and exploitation but have a little more foresight and be a little more "conservation minded". The constant increasing demand for land is seriously closing in on the habitat of plant and animal life. Although the present situation allows exploration for minerals, and if none are found the land can become a wilderness area, it is really no longer a wilderness area after exploration has taken place.

CANFORD ENGINEERING LIMITED

NEIL J. DUNCAN

The brief offers comments on some proposals and suggestions which were presented at the public hearing in Edmonton.

Mountain-Foothill Coal Economics:

1. Briefs on environment in the foothills accepted in the main that mining of coal will continue.
2. Decline of oil and gas in the province will commence in two or three years.
3. All operators opposed the expropriation clauses of the suggested legislation. New laws should exclude such clauses but include clear guidelines to a firm law enforcement agency.
4. Two excellent suggestions were zoning of mining permisability and preparation of overlays; these coal areas should include foothill reserves of high quality non-coking bituminous coals.



### Mountain-Foothill Region

The Company appreciates that the Authority is limited to the Province of Alberta in its public hearings, but it submits that this is unfortunate and that new laws should apply to the entire region. Mining in areas of British Columbia may have serious effects on the Alberta environment. Furthermore, provinces should not be "played off one against the other" as one author wrote.

### C. L. SIBBALD, P. Ag.

The theme of the brief centers around the fact that the government of Alberta is now faced with relatively new conditions in terms of an upsurge in coal mining operations on the one hand and an antagonistic reaction from some sectors of the public on the other hand. As a consequence of this new guidelines have had to be drawn and more are needed.

### Detection and Measurement

A number of electronic instruments are available to detect and measure damage. Air photos, particularly infrared photos, can also be used for the same purpose. Legislation in Alberta should continue to encourage the expansion and use of equipment and services as described in this brief.

### Correction

The following practices should be considered:

1. Each restoration situation should be treated separately as much as possible.
2. There is a distinct lack of understanding of the complexity of ecosystems by many people in Alberta. To understand these problems we need a good supply of manpower that is skilled in both biology and mathematics.
3. There should be a system of zoning for multiple use resource exploitation.

4. Information obtained for companies by professional and technical advisors can be beneficial to resource management.

## ALBERTA FISH AND GAME ASSOCIATION - ZONE 2

MR. T. MCKAY

### Introduction

Alberta can expect to see a continuing increase in surface mining over the next several years. This will result from a demand for more electrical power and more coking coal and from the role coal will play in meeting the oil and gas shortage. The purpose of this submission is to describe the mining practices of tomorrow. The reclamation procedures and regulations of tomorrow, a result of increased surface mining activity, cannot be as lax as those of today. Because of a pending shortage of oil and gas in the future additional forms of energy must be sought. Most of this energy lies in Alberta in the form of tar sands and coal and this will mean more exploitation of these solid fossil fuels.

Nuclear power may help to fill part of the energy gap left by oil and gas, however, present technology does not permit it to be used in transportation, industry or commerce.

If coal is the answer to the energy shortage, then it will have to be used in other than its solid form. Liquifaction and gasification of coal seem to offer, long range, the most certain available domestic supply of both liquid petroleum and pipeline gas. There are three basic methods of coal gasification: a) pyrolysis, the direct application of heat to the coal with the driving off of the volatile matter; b) hydrogenation, externally produced hydrogen is added directly to the coal under moderate temperatures and elevated pressures to form methane gas and other hydrocarbons; (c) gasification - methanization, making synthetic gas ( $H_2$ -CO Mixture) and catalytically upgrading it to methane.

It is expected that coal gasification will be located in Alberta because large coal beds are traversed by natural gas transmission

lines, there is a large supply of water, and the coal is relatively sulphur free.

The size of the mines that will supply feed-stock to coal conversion plants is enormous. Some 15,000 - 50,000 tons of coal are required to make 50,000 barrels of synthetic crude oil. To remain economical for fifteen to twenty years at this rate of supply, coal properties forty square miles in area with a six foot seam must be blocked out.

It can be shown then that surface mining in Alberta will increase. Reclamation must be immediate and thorough and thus the following recommendations for reclamation are made:

1. More attention must be paid to the removal, storage and replacement of overburden and topsoil.
2. A time limit can be set as to when replacement of the overburden must take place, ideally a maximum time limit would be six months.
3. Reclamation plans must be made well in advance of the commencement of strip mining.
4. Areas of the province that cannot be reclaimed should be exempt from strip mining.
5. The construction of roads, trails, stream crossings, etc., must be kept to a minimum.

MR. P. E. FULLER

Mr. Fuller noted that there were three important revelations coming from the hearings in Calgary: the percentage of the total coal reserves in the foothills and mountains of Alberta that is amenable to strip mining is low; the employment possibilities of strip mining are small; no company engaged in strip mining will voluntarily spend one dollar on surface reclamation but only such amounts that are necessary to discharge legal operations.

Mr. Fuller stated that in certain environments, particularly the foothills and mountains, there should be a total ban on strip mining, If this is not possible, stringent regulations must be imposed on all phases of operations and reclamation.

MR. F. WALCOTT

The author, from California, has been a visitor in Alberta and is an admirer of the province. He offers these comments:

Although it is clear that a substantial economic benefit to the immediate area will result, on a short term basis, it is questionable whether the environmental damage might not, over the long term, result in an even greater economic loss.

A key point in determining whether any such activity can be permitted is if corrective action can restore an area to its prior condition.

Much of the damage in the mountains and foothills is less immediately obvious than in the plains, but watershed destruction may well be more permanent and more damaging than any other effect.

MR. R. E. KELLY

The author stated that he has never seen anything so absolutely ugly as a strip mine, exhausted and left for nature to repair the wounds. His express wish was that we try to preserve the natural beauty of Alberta intact.

MS. A. HARMON

The author attended the hearings in Calgary and commented that during the question period what perhaps may have looked like fuzzy argument was possibly really due to lack of available information. Two points that the author felt were not brought out in the hearing was the damage caused by indiscriminate and ill-controlled exploration for coal and the results of excavating and the line plant in the Bow Valley east of Exshaw.



## FEDERATION OF WESTERN OUTDOOR CLUBS

MR. B. EVANS

The Federation of Western Outdoor Clubs is an organization of some 170,000 members in the western United States and has played an extremely active role in a long-term effort to conserve and protect the scenic wilderness of this part of the U.S. Numerous Canadians are members of the club.

It is admittedly probably cheaper in the U.S. and Canada for the mine operator to use the strip mining methods rather than the deep mine methods. The reason for this cost difference is that the operator passes on the additional environmental and social costs to the local community, provincial, or federal governments. The average strip mine hires five or six people and any economic benefit is short-term construction at the beginning of an operation. After the operations have ceased the coal companies are richer, and the local communities and governments are poor economically, as well as having ugly, barren, useless land.

### U.S. Legislative Experience

In the United States legal restrictions speak of preventing "unreasonable" pollution and revegetating only "where practical". In practice, the coal industry has always been able to "prove" that the environmentally sound course is never "practical" or economically feasible".

### Conclusions and Recommendations

The Statements of Concepts prepared by the Department of the Environment appears to be far more comprehensive than most legislation now found in the United States. The following are suggested as additions or clarifications:

1. Section 2.1 is essentially unnecessary; it would be more appropriate to include a statement about the increased demand in need of our urban population of high quality environment.

2. Section 2.5 might be strengthened further by saying that the privilege cannot only be made conditional, but that it does not have to be issued at all.
3. It is important that the Minister can prohibit or prevent any mining of any type where these values are more important than mining values.
4. All too often in the United States, provisions for bonds have been set much too low to truly permit effective reclamation. The security required to be posted should be at least \$1,000.00 an acre, and probably more in most places.

In sum the Federation feels that the best possible position to take is to completely ban and prohibit all forms of strip mining, anywhere and for whatever reasons.

#### CENTRAL ALBERTA BIG GAME TROPHY CLUB

##### MR. J. O. PATON

The Club is concerned with the Bow and Clearwater Forest Reserves. The elk herds that summer in the park are forced out into these foothills in the early winter by deep snow and are able to obtain food. This area is vital to our wildlife and must be kept intact.

The club questions the government on two counts, one, for subsidizing the coal companies ninety cents a ton to help these companies show a profit, and two, for the building of railroads for these mines free of charge.

The club urges the Minister to draft an act that is strict enough to force the mining companies to clean up their mess completely, and then plant new growth on the land and maintain it until such time as it can take care of itself.

The revenue taken by the government directly from hunting runs into the millions of dollars, from the tax on gasoline used by hunters, from licenses and liquor taxes.

MR. T. BECK

- A. Environmental Implications: The Panther-Red Deer River area is a traditional and important wintering ground for several species of ungulates and supports much of the beautiful flora and fauna with which we are familiar. We must know what the effect on wildlife will be if mining proceeds.
- B. Reclamation: Much more research is needed before reclamation regulations can reasonably be set.
- C. Political and Economical Considerations: Provincial legislatures have a recognized responsibility for maintaining an atmosphere conducive to a healthy economy and to improve the quality of life of present and future generations. Is it not possible that benefits from strip mining may be exceeded by those derived from other sources?
- D. Alternatives: Tourism involves all areas of our Province and promotes conservation and preservation, and guards against pollution, when compared to heavy industry.
- E. Recommendations: The many unanswered questions raised are perhaps the best indicator of the fact that not enough is known of long-term effects of strip mining on our environment to permit additional exploration and development at this time.

It is requested that: The Authority recommend to Government that a moratorium be declared on exploration and on any new development; in the case of presently operating mines, a study should be conducted on what is not being accomplished by present reclamation techniques; National Park boundaries be redefined to include traditional game migration routes.

MR. J. BURNES

The author wishes to present a few thoughts. Experience and observation make it apparent that the biggest problem is the enforcing of any reclamation program, thus any enforced reclamation will be a headache for the Government or overseeing agency, if this reclamation is

left to the last. The reclamation program should be written into the contract as a continuing program and it would be helpful if the appropriate union was made a part of the enforcement agency.

MR. R. H. CARLYLE

The two opposing factors in the present controversy are the conservationists who protect against degradation of the environment, and Government and Industry who point to the need for an expanding economy. Perhaps the most sensible course for the present would be a compromise between the two positions. More money should be spent studying other methods of developing electric power such as geothermal steam, solar energy, tides, etc.

Although power companies advertise electricity as a very clean source of light, power and heat, they say nothing about the environmental deterioration created; power consumption could be reduced without causing any great inconvenience to the average consumer as many present users are unnecessary.

MR. R. F. MOUNTAIN

In many parts of Alberta coal can be strip mined with little damage to the environment, whereas in some mountain areas strip mining is so detrimental that it should not be carried out at all. A large sum of money should be paid to the Government, before any excavating is started, as insurance that a pre-arranged reclamation program be carried out.



MR. F. C. MARFLEET

This is an appeal to exhort the Government of Alberta to arrest the impending ruination of that part of Alberta which is known as the Alberta Forest Reserve. The author believes that we should do this at any cost, for the aesthetic value of the natural flora and fauna is worth it, and once this natural order is disturbed it cannot ever be restored.

There are two aspects of industrial development either of which will result in unrestorable destruction of our biome. One is the installation of factories for refining oil and the by-products within the boundaries of the Reserve. The second is a threat of proposed strip mining of coal in our foothills, foothills situated on the Red Deer river drainage. This area is coincidental with the breeding grounds of the Rocky Mountain Bighorn Sheep and should the strip mining become a reality it can only mean the extinction of these animals in this locale.

ROCKY MOUNTAIN HOUSE CHAMBER OF COMMERCE

MR. T. HOFFMAN

The Chamber of Commerce offered the following reasons for opposing the strip mining that is proposed in the foothills of the Eastern Rockies and the Rocky Mountains themselves. First, are we about to embark on a program which will result in us destroying the most valuable recreation area in our Province, excluding the National Parks, for the sake of obtaining approximately \$62,000 worth of coal per acre? Second, our most precious possession is a supply of fresh, clean water, and it is considered as one of the most valuable resources by all sections of society. Can the Government argue that we are not affecting this valuable resource by proposed strip mining from the foothills in the Crowsnest Pass to the Hinton area? Third, the number of jobs provided by opening strip mines are relatively few. Fourth, mining areas which have been set aside are the habitat of animal life and would certainly affect their grazing areas.

SUNDRE AND DISTRICT CHAMBER OF COMMERCE

MR. O. A. PROCHYSHEN

The Chamber of Commerce wishes to go on record as being unanimously opposed to further destruction in the Panther River area by industry. This wilderness area has already been disturbed and marred by the oil industry and the life habitats of wild game have been disturbed.

The Ya Ha Tinda is an attraction that draws many people as its plant life is absolutely foreign to the flora and fauna of mountain terrain surrounding it. The Chamber of Commerce feels strongly that this area should be left as it is now, without further encroachment, either by industry or private concern.

PUBLIC ADVISORY COMMITTEE ON THE ENVIRONMENT, NON-RENEWABLE RESOURCES  
STUDY GROUP

---

Recommendations

1. Industry and the public in general require clarification of the relative responsibilities of various Government Departments and Agencies with respect to regulating the activities of the extractive resource industry.
2. The new Coal Conservation Act should include more explicit information regarding the role of other departments in regulating coal mine development.
3. Re: Brief by Gene Shelley of Macroplan Consultants Ltd., Edmonton on "Reclamation and Recreation".  
The Committee would like to record their approval of the concept of "functional reclamation" outlined in this brief as opposed to restorative reclamation.
4. In areas of known strip mining potential, the Provincial Government should undertake a preliminary extensive survey of all natural resources prior to the start of exploration activity and an intensive resource inventory prior to extraction activity.
5. This Study Group wishes to record its endorsement of the principle that all mining operators guarantee prior to development, the conduct of reclamation procedures.

THE AD HOC COMMITTEE OF THE PUBLIC ADVISORY COMMITTEE  
ON ENVIRONMENTAL SCIENCES

The question of alternative uses for public lands in Alberta seems never to have received serious study. In view of the fact that benefit-cost analyses will only provide guidance on the question of whether social costs and risks are offset by benefits, it is proposed that a Land Use Committee be established in Alberta to take responsibility for policy formulation on resource use and development. In addition, there is a need for another body to oversee the application of policy and enforcement of any regulations relating to environmental impact. Both these bodies should be comprised of people drawn from a variety of disciplines, and draw upon both government and non-government personnel.

There is a concern among citizens about the disposition of public lands. The current emphasis on "reclamation" as opposed to a comprehensive Optimal Resource Use Plan will do little to allay their disquiet. In the development of any such plan, there must be room for public involvement and provision for a mechanism by which opinions can be heard and considered.

We believe that regulations concerning reclamation of disturbed land should treat public and private land in a similar manner. Furthermore, in order to reduce confusion and overlap, all regulations pertaining to reclamation should be administered by the Department of the Environment.

Enlightened mining companies are already aware of the potential value of disturbed land for recreational use, following the cessation of mining activity. We should ask that all publicly owned lands be treated no less well than deeded land.

We endorse the document entitled "A Summary of Principles Underlying Proposed Surface Reclamation Legislation", with only minor amendments.

In conclusion, a set of regulations is suggested which are summarized as follows:

1. Prior to any exploration and/or mining development involving surface disturbance taking place, the operator must file an application containing a detailed exploration, development and reclamation plan (with timetable) with the Land Use Committee. After reviewing the operators' proposal and any submissions from the Public, the Committee shall either (a) accept it, (b) accept it with certain modifications, or

(c) reject it.

2. The Committee shall be made up of appropriate professionals and each shall certify the part of the application on which his specialty bears.
3. The responsibility of ensuring that the accepted plan is carried out shall be placed on the operator.
4. Reclamation and revegetation should be progressive wherever feasible rather than being delayed until mining has been completed.
5. All spoil piles must be vegetated, and none will be allowed to exceed a final slope of  $27^{\circ}$  (2:1).
6. The operator shall be required to post a performance bond that will be sufficient (in the view of the Land Use Committee) to reclaim the land if he fails to do so.
7. Specifications of the kinds and numbers of roads that will be built into mining areas must be provided by the Land Use Committee.
8. Unless there are good geological reasons, the coal face remaining after mining must be covered by an appropriate thickness of clean dirt fill.
9. Unless there are good geological reasons, the maximum slope of the high wall must be such that it will support vegetation after mining ceases, where vegetation originally existed.
10. No surface mining should be permitted close to a stream, adequate buffers must be left. Wherever feasible, buffers of vegetation for aesthetic purposes should be left.
11. Public Hearings must be held before a decision is made on strip mining or other resource development involving surface disturbance within sight or sound of a National or Provincial Park, or other areas whose main value stems from their being retained in a "natural" state.



## INDEX

Abcon Engineering (Alberta) Limited .....	106
Alberta Coal Limited .....	63
Alberta Economic Development and Productivity Council .....	169
Alberta Federation of Labour, C.L.C. ....	156
Alberta Fish and Game Association .....	148
... Affiliate Clubs, Zone 2 .....	189
... Medicine Hat .....	187
... Zone 1 .....	145
... Zone 3 .....	149
Alberta Geographical Society .....	165
Alberta Power Limited ... see ... Canadian Utilities Limited ..	
Alberta Wilderness Association .....	132
Allen, G. ....	32
Alpine Club of Canada. Edmonton Section .....	120
Archaeological Society of Alberta. Calgary Centre .....	168
Barnes, G. ....	78
Barrett, Mayor R.E. ....	25
Bayly, H.E. ....	189
Beck, T. ....	194
Bedard, T.L. ....	56
Beechinor, D. ....	182
Big Game and Guide Outfitters .....	153
Bigg W.L. ....	173
Blackstock, W.J. ....	106
Bouthellier, P.H. ....	173
Bow Valley Naturalists Society .....	129
Brakenbury, J. ....	114
British Columbia. Peace River-Liard Regional Planning Authority .....	33
Brown, F. ....	180
Brown, R.C.....	180
Burness, J. ....	194
Calgary Eco-Centre Society .....	143
Calgary Field Naturalists' Society .....	128
Calgary Power Limited .....	91
Cameron, G. ....	86
Canada. Department of Environment .....	18
Canada. Department of Indian Affairs & Northern Development National and Historic Parks Branch .....	16
Canadian Utilities Limited .....	86
Canadian Wolf Defenders .....	135
Canford Engineering Limited .....	187
Canmore Mines Limited .....	72
Carlyle, R.H.....	196
Central Alberta Big Game Trophy Club .....	193
Chandless, C.R. ....	186
Cholach, M.S. ....	84
City of Lethbridge .....	23
City of Red Deer .....	25

Coal Association of Canada .....	78
Coates, G. ....	49
Coleman Colliers Limited .....	44
Collins, A.F. ....	63
Committee on Rundle Mountain Strip Mine .....	166
Communications Employee's Fish and Game Association .....	147
Consolidation Coal Company of Canada .....	84
Consultant's Report .....	5
County of Paintearth .....	26
Coutts, D.B.....	168
Creore, J.....	120
Cumming, E.K. ....	162
Cundy, R. ....	36
Daniel, E.E. ....	138
D.A.W.N. Defenders and Wardens of Nature .....	135
Davidson, E. ....	172
Defenders and Wardens of Nature. D.A.W.N. ....	135
Dickson Fish and Game Association .....	150
Ditchburn, W.J.....	134
Drinkwater, M.H. ....	17
Dunkley, C. ....	125
Edmonton Chamber of Commerce .....	162
Edmonton Natural History Club .....	119
Environment Canada .....	17
Evans, B. ....	192
F.F. Slaney and Company Limited .....	5
Federation of Western Outdoor Clubs .....	192
Fennel, A. ....	98
Fuller, P.E. ....	190
Flook, W.A. ....	135
Gawlak, M. ....	174
Guest, R. ....	135
Hackbarth, D.A. ....	186
Halliday, I.A.R. ....	128
Hamilton, G.C. ....	119
Hammond, J. ....	23
Harmon, A. ....	191
Harris, A.L. ....	177
Harvie Heights Rate Payers .....	168
Hodges, G.E. ....	153
Hoffman, T. ....	196
Holluraus, D.F. ....	33
Hook and Hackle Club .....	154
I.C.E.Q. ....	138
I-XL Industries Limited .....	99
Interdisciplinary Committee for Environmental Quality .....	138
International Union of Operating Engineers .....	155

James A. ....	173
Jamieson, E.D. ....	44
Jensen, H. ....	152
Kelly, R.E. ....	191
Kerr, J. ....	142
Kure, E. ....	184
Kvisle, N. ....	181
Lacy, C. ....	175
Lacombe Fish and Game Association ....	152
Lembicz, H. ....	184
Lethbridge, Alberta ....	23
Lethbridge Fish and Game Association ....	145
Lethbridge Natural History Society ....	118
Lewis, P. ....	136
Liberal Party in Alberta ....	161
Lightfoot, E. ....	153
Lindoe, L.O. ....	99
Longson, M.C. ....	157
Luscar Limited ....	49
Macroplan Consultants Limited ....	110
Malis, R.P. ....	16
Marfleet, F.C. ....	196
Master Explorations Limited ....	103
McBride, R.F. ....	182
McGregor, J. ....	143
McIntyre Coal Mines Limited ....	56
McIvor, M.D. ....	129
McKay, T. ....	189
McLaughlin, I.G. ....	99
McNabb, G. ....	132
Medicine Hat. Alberta Fish and Game Association ....	187
Mellon, G.B. ....	39
Meredith, D. ....	123
Michalsky, W. ....	172
Mitchell, C. ....	169
Mitchell, E. ....	156
Molgaard, K. ....	141
Mountain, R.F. ....	195
National and Provincial Parks Association of Canada. Calgary/Banff Chapter.....	125
National and Provincial Parks Association of Canada. Edmonton Chapter .....	123
National and Historic Parks Branch. Canada Department of Indian Affairs and Northern Development .....	16
Nessel, I.C.....	155
Nicholson, J. ....	33
Nick's Landscaping .....	112
Nicol, W. ....	158

Oldman River Regional Planning Commission .....	33
Page, R.J. ....	159
Panchysyn, E.J. ....	103
Paintearth County .....	26
Paton, J.O. ....	193
Peace River-Liard Regional Planning District. British Columbia..	33
Peace River Regional Planning Commission .....	32
Pearce, A.F. ....	157
Peck, H.G. ....	117
Peel, G.....	148
Pegasus Experimental Metals and Mining Limited .....	98
Pigeon, W.G.....	147
Pittman, G.M. ....	145
Pollution Control - Southern Alberta .....	136
Procter and Gamble Cellulose Limited .....	94
Procyshen, O.A. ....	197
Psaltis, T. ....	145
Public Advisory Committee on Environmental Sciences .....	199
Public Advisory Committee on the Environment. Non-Renewable Resources Study .....	198
Ratepayers of Harvie Heights. Committee on Rundle Mountain Strip Mine .....	166
Red Deer, Alberta .....	25
Red Deer Fish and Game Association .....	150
Red Deer Regional Planning Commission .....	36
Research Coucil of Alberta. Geology Division .....	39
Rhodes, H. ....	149
Roberts, C. ....	60
Rocky Mountain House Chamber of Commerce .....	196
Rocky Mountain Ramblers Association .....	117
Roles, D.....	135
Romanchuk, A.S.....	161
Rundle Mountain Strip Mine Committee .....	166
Rutherford, W. ....	154
St. Albert Fish and Game Association .....	146
Save Tomorrow - Oppose Pollution (STOP) .....	141
Scammell, R. ....	150
Schores, D.D. ....	94
Schultz, F. ....	118, 145
Schultz, W.M. ....	176
Scoville, E.E. ....	187
Shaw, W.G.A.....	36
Shelly, G.R. ....	110
Sibbald, C.L. ....	188
Slaney, F.F. and Company .....	5
Society for Pollution and Environmental Control (SPEC) .....	142
SPEC (Society for Pollution and Environmental Control) .....	142
St. Albert Fish and Game Association .....	146
Stanley, T.D. ....	91
Stein, J. ....	180

Stephenson, G.H. ....	72
Sterling Coal Valley Mining Company .....	60
STOP (Save Tomorrow - Oppose Pollution) .....	141
Story, N.V. ....	166, 179
Stretch, G. ....	146
Stutchbury, E.W.....	186
Sundre and District Chamber of Commerce .....	197
Tomilson, G. ....	26
Towle, J. ....	152
Unifarm .....	159
... Region I .....	157
... Region 14 .....	158
United Mine Workers of America .....	158
Wapiti Fish and Game Association .....	189
Webb, R. ....	12
Walcott, F. ....	191
Whistance-Smith, R. ....	165
Wild Kakwa .....	114
Wighton, C. ....	163
Wighton Family .....	163
Wotherspoon, J. ....	112













31775